INSTALLATION AND OPERATION MANUAL

Optimux-106

Four-Channel T1 and Ethernet Multiplexer

Version 6.1

RAD
data communications
The Access Company

Optimux-106

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Product Disposal

To facilitate the reuse, recycling and other forms of recovery of waste equipment in protecting the environment, the owner of this RAD product is required to refrain from disposing of this product as unsorted municipal waste at the end of its life cycle. Upon termination of the unit's use, customers should provide for its collection for reuse, recycling or other form of environmentally conscientious disposal.

General Safety Instructions

The following instructions serve as a general guide for the safe installation and operation of telecommunications products. Additional instructions, if applicable, are included inside the manual.

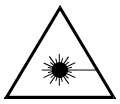
Safety Symbols

Warning

This symbol may appear on the equipment or in the text. It indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.

Danger of electric shock! Avoid any contact with the marked surface while the product is energized or connected to outdoor telecommunication lines.

Protective ground: the marked lug or terminal should be connected to the building protective ground bus.



Warning

Some products may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the optical transmitter. The laser warning symbol may be also attached.

Please observe the following precautions:

- Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the transmitter.
- Do not attempt to adjust the laser drive current.
- Do not use broken or unterminated fiber-optic cables/connectors or look straight at the laser beam.
- The use of optical devices with the equipment will increase eye hazard.
- Use of controls, adjustments or performing procedures other than those specified herein, may result in hazardous radiation exposure.

ATTENTION: The laser beam may be invisible!

In some cases, the users may insert their own SFP laser transceivers into the product. Users are alerted that RAD cannot be held responsible for any damage that may result if non-compliant transceivers are used. In particular, users are warned to use only agency approved products that comply with the local laser safety regulations for Class 1 laser products.

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this product. No installation, adjustment, maintenance or repairs should be performed by either the operator or the user.

Handling Energized Products

General Safety Practices

Do not touch or tamper with the power supply when the power cord is connected. Line voltages may be present inside certain products even when the power switch (if installed) is in the OFF position or a fuse is blown. For DC-powered products, although the voltages levels are usually not hazardous, energy hazards may still exist.

Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts.

Unless otherwise specified, all products are intended to be grounded during normal use. Grounding is provided by connecting the mains plug to a wall socket with a protective ground terminal. If a ground lug is provided on the product, it should be connected to the protective ground at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in grounded racks and cabinets.

Always make the ground connection first and disconnect it last. Do not connect telecommunication cables to ungrounded equipment. Make sure that all other cables are disconnected before disconnecting the ground.

Some products may have panels secured by thumbscrews with a slotted head. These panels may cover hazardous circuits or parts, such as power supplies. These thumbscrews should therefore always be tightened securely with a screwdriver after both initial installation and subsequent access to the panels.

Connecting AC Mains

Make sure that the electrical installation complies with local codes.

Always connect the AC plug to a wall socket with a protective ground.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A (20A for USA and Canada). The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A (40A for USA and Canada).

Always connect the power cord first to the equipment and then to the wall socket. If a power switch is provided in the equipment, set it to the OFF position. If the power cord cannot be readily disconnected in case of emergency, make sure that a readily accessible circuit breaker or emergency switch is installed in the building installation.

In cases when the power distribution system is IT type, the switch must disconnect both poles simultaneously.

Connecting DC Power

Unless otherwise specified in the manual, the DC input to the equipment is floating in reference to the ground. Any single pole can be externally grounded.

Due to the high current capability of DC power systems, care should be taken when connecting the DC supply to avoid short-circuits and fire hazards.

Make sure that the DC power supply is electrically isolated from any AC source and that the installation complies with the local codes.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A (20A for USA and Canada). The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A (40A for USA and Canada).

Before connecting the DC supply wires, ensure that power is removed from the DC circuit. Locate the circuit breaker of the panel board that services the equipment and switch it to the OFF position. When connecting the DC supply wires, first connect the ground wire to the corresponding terminal, then the positive pole and last the negative pole. Switch the circuit breaker back to the ON position.

A readily accessible disconnect device that is suitably rated and approved should be incorporated in the building installation.

If the DC power supply is floating, the switch must disconnect both poles simultaneously.

Connecting Data and Telecommunications Cables

Data and telecommunication interfaces are classified according to their safety status.

The following table lists the status of several standard interfaces. If the status of a given port differs from the standard one, a notice will be given in the manual.

Ports	Safety Status	
V.11, V.28, V.35, V.36, RS-530, X.21, 10 BaseT, 100 BaseT, Unbalanced E1, E2, E3, STM, DS-2, DS-3, S-Interface ISDN, Analog voice E&M	SELV	Safety Extra Low Voltage: Ports which do not present a safety hazard. Usually up to 30 VAC or 60 VDC.
xDSL (without feeding voltage), Balanced E1, T1, Sub E1/T1	TNV-1	Telecommunication Network Voltage-1: Ports whose normal operating voltage is within the limits of SELV, on which overvoltages from telecommunications networks are possible.
FXS (Foreign Exchange Subscriber)	TNV-2	Telecommunication Network Voltage-2: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are not possible. These ports are not permitted to be directly connected to external telephone and data lines.
FXO (Foreign Exchange Office), xDSL (with feeding voltage), U-Interface ISDN	TNV-3	Telecommunication Network Voltage-3: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are possible.

Always connect a given port to a port of the same safety status. If in doubt, seek the assistance of a qualified safety engineer.

Always make sure that the equipment is grounded before connecting telecommunication cables. Do not disconnect the ground connection before disconnecting all telecommunications cables.

Some SELV and non-SELV circuits use the same connectors. Use caution when connecting cables. Extra caution should be exercised during thunderstorms.

When using shielded or coaxial cables, verify that there is a good ground connection at both ends. The grounding and bonding of the ground connections should comply with the local codes.

The telecommunication wiring in the building may be damaged or present a fire hazard in case of contact between exposed external wires and the AC power lines. In order to reduce the risk, there are restrictions on the diameter of wires in the telecom cables, between the equipment and the mating connectors.

Caution To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cords.

Attention Pour réduire les risques s'incendie, utiliser seulement des conducteurs de télécommunications 26 AWG ou de section supérieure.

Some ports are suitable for connection to intra-building or non-exposed wiring or cabling only. In such cases, a notice will be given in the installation instructions.

Do not attempt to tamper with any carrier-provided equipment or connection hardware.

Electromagnetic Compatibility (EMC)

The equipment is designed and approved to comply with the electromagnetic regulations of major regulatory bodies. The following instructions may enhance the performance of the equipment and will provide better protection against excessive emission and better immunity against disturbances.

A good ground connection is essential. When installing the equipment in a rack, make sure to remove all traces of paint from the mounting points. Use suitable lock-washers and torque. If an external grounding lug is provided, connect it to the ground bus using braided wire as short as possible.

The equipment is designed to comply with EMC requirements when connecting it with unshielded twisted pair (UTP) cables. However, the use of shielded wires is always recommended, especially for high-rate data. In some cases, when unshielded wires are used, ferrite cores should be installed on certain cables. In such cases, special instructions are provided in the manual.

Disconnect all wires which are not in permanent use, such as cables used for one-time configuration.

The compliance of the equipment with the regulations for conducted emission on the data lines is dependent on the cable quality. The emission is tested for UTP with 80 dB longitudinal conversion loss (LCL).

Unless otherwise specified or described in the manual, TNV-1 and TNV-3 ports provide secondary protection against surges on the data lines. Primary protectors should be provided in the building installation.

The equipment is designed to provide adequate protection against electro-static discharge (ESD). However, it is good working practice to use caution when connecting cables terminated with plastic connectors (without a grounded metal hood, such as flat cables) to sensitive data lines. Before connecting such cables, discharge yourself by touching ground or wear an ESD preventive wrist strap.

FCC-15 User Information

This equipment has been tested and found to comply with the limits of the Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the Installation and Operation manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Emission Requirements

This Class A digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Warning per EN 55022 (CISPR-22)

Warning	This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user will be required to take adequate measures.
Avertissement	Cet appareil est un appareil de Classe A. Dans un environnement résidentiel, cet appareil peut provoquer des brouillages radioélectriques. Dans ces cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.
Achtung	Das vorliegende Gerät fällt unter die Funkstörgrenzwertklasse A. In Wohngebieten können beim Betrieb dieses Gerätes Rundfunkströrungen auftreten, für deren Behebung der Benutzer verantwortlich ist.

Mise au rebut du produit

Afin de faciliter la réutilisation, le recyclage ainsi que d'autres formes de récupération d'équipement mis au rebut dans le cadre de la protection de l'environnement, il est demandé au propriétaire de ce produit RAD de ne pas mettre ce dernier au rebut en tant que déchet municipal non trié, une fois que le produit est arrivé en fin de cycle de vie. Le client devrait proposer des solutions de réutilisation, de recyclage ou toute autre forme de mise au rebut de cette unité dans un esprit de protection de l'environnement, lorsqu'il aura fini de l'utiliser.

Instructions générales de sécurité

Les instructions suivantes servent de guide général d'installation et d'opération sécurisées des produits de télécommunications. Des instructions supplémentaires sont éventuellement indiquées dans le manuel.

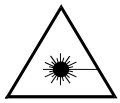
Symboles de sécurité

Avertissement

Ce symbole peut apparaitre sur l'équipement ou dans le texte. Il indique des risques potentiels de sécurité pour l'opérateur ou le personnel de service, quant à l'opération du produit ou à sa maintenance.

Danger de choc électrique ! Evitez tout contact avec la surface marquée tant que le produit est sous tension ou connecté à des lignes externes de télécommunications.

Mise à la terre de protection : la cosse ou la borne marquée devrait être connectée à la prise de terre de protection du bâtiment.



Avertissement

Certains produits peuvent être équipés d'une diode laser. Dans de tels cas, une étiquette indiquant la classe laser ainsi que d'autres avertissements, le cas échéant, sera jointe près du transmetteur optique. Le symbole d'avertissement laser peut aussi être joint.

Veuillez observer les précautions suivantes :

- Avant la mise en marche de l'équipement, assurez-vous que le câble de fibre optique est intact et qu'il est connecté au transmetteur.
- Ne tentez pas d'ajuster le courant de la commande laser.
- N'utilisez pas des câbles ou connecteurs de fibre optique cassés ou sans terminaison et n'observez pas directement un rayon laser.
- L'usage de périphériques optiques avec l'équipement augmentera le risque pour les yeux.
- L'usage de contrôles, ajustages ou procédures autres que celles spécifiées ici pourrait résulter en une dangereuse exposition aux radiations.

ATTENTION : Le rayon laser peut être invisible !

Les utilisateurs pourront, dans certains cas, insérer leurs propres émetteurs-récepteurs Laser SFP dans le produit. Les utilisateurs sont avertis que RAD ne pourra pas être tenue responsable de tout dommage pouvant résulter de l'utilisation d'émetteurs-récepteurs non conformes. Plus particulièrement, les utilisateurs sont avertis de n'utiliser que des produits approuvés par l'agence et conformes à la réglementation locale de sécurité laser pour les produits laser de classe 1.

Respectez toujours les précautions standards de sécurité durant l'installation, l'opération et la maintenance de ce produit. Seul le personnel de service qualifié et autorisé devrait effectuer l'ajustage, la maintenance ou les réparations de ce produit. Aucune opération d'installation, d'ajustage, de maintenance ou de réparation ne devrait être effectuée par l'opérateur ou l'utilisateur.

Manipuler des produits sous tension

Règles générales de sécurité

Ne pas toucher ou altérer l'alimentation en courant lorsque le câble d'alimentation est branché. Des tensions de lignes peuvent être présentes dans certains produits, même lorsque le commutateur (s'il est installé) est en position OFF ou si le fusible est rompu. Pour les produits alimentés par CC, les niveaux de tension ne sont généralement pas dangereux mais des risques de courant peuvent toujours exister.

Avant de travailler sur un équipement connecté aux lignes de tension ou de télécommunications, retirez vos bijoux ou tout autre objet métallique pouvant venir en contact avec les pièces sous tension.

Sauf s'il en est autrement indiqué, tous les produits sont destinés à être mis à la terre durant l'usage normal. La mise à la terre est fournie par la connexion de la fiche principale à une prise murale équipée d'une borne protectrice de mise à la terre. Si une cosse de mise à la terre est fournie avec le produit, elle devrait être connectée à tout moment à une mise à la terre de protection par un conducteur de diamètre 18 AWG ou plus. L'équipement monté en châssis ne devrait être monté que sur des châssis et dans des armoires mises à la terre.

Branchez toujours la mise à la terre en premier et débranchez-la en dernier. Ne branchez pas des câbles de télécommunications à un équipement qui n'est pas mis à la terre. Assurez-vous que tous les autres câbles sont débranchés avant de déconnecter la mise à la terre.

Connexion au courant du secteur

Assurez-vous que l'installation électrique est conforme à la réglementation locale.

Branchez toujours la fiche de secteur à une prise murale équipée d'une borne protectrice de mise à la terre.

La capacité maximale permissible en courant du circuit de distribution de la connexion alimentant le produit est de 16A (20A aux Etats-Unis et Canada). Le coupe-circuit dans l'installation du bâtiment devrait avoir une capacité élevée de rupture et devrait fonctionner sur courant de court-circuit dépassant 35A (40A aux Etats-Unis et Canada).

Branchez toujours le câble d'alimentation en premier à l'équipement puis à la prise murale. Si un commutateur est fourni avec l'équipement, fixez-le en position OFF. Si le câble d'alimentation ne peut pas être facilement débranché en cas d'urgence, assurez-vous qu'un coupe-circuit ou un disjoncteur d'urgence facilement accessible est installé dans l'installation du bâtiment.

Le disjoncteur devrait déconnecter simultanément les deux pôles si le système de distribution de courant est de type IT.

Connexion d'alimentation CC

Sauf s'il en est autrement spécifié dans le manuel, l'entrée CC de l'équipement est flottante par rapport à la mise à la terre. Tout pôle doit être mis à la terre en externe.

A cause de la capacité de courant des systèmes à alimentation CC, des précautions devraient être prises lors de la connexion de l'alimentation CC pour éviter des courts-circuits et des risques d'incendie.

Assurez-vous que l'alimentation CC est isolée de toute source de courant CA (secteur) et que l'installation est conforme à la réglementation locale.

La capacité maximale permissible en courant du circuit de distribution de la connexion alimentant le produit est de 16A (20A aux Etats-Unis et Canada). Le coupe-circuit dans l'installation du bâtiment devrait avoir une capacité élevée de rupture et devrait fonctionner sur courant de court-circuit dépassant 35A (40A aux Etats-Unis et Canada).

Avant la connexion des câbles d'alimentation en courant CC, assurez-vous que le circuit CC n'est pas sous tension. Localisez le coupe-circuit dans le tableau desservant l'équipement et fixez-le en position OFF. Lors de la connexion de câbles d'alimentation CC, connectez d'abord le conducteur de mise à la terre à la borne correspondante, puis le pôle positif et en dernier, le pôle négatif. Remettez le coupe-circuit en position ON.

Un disjoncteur facilement accessible, adapté et approuvé devrait être intégré à l'installation du bâtiment.

Le disjoncteur devrait déconnecter simultanément les deux pôles si l'alimentation en courant CC est flottante.

Glossary

Address	A coded representation of the origin or destination of data.
Agent	In SNMP, this refers to the managed system.
ANSI	American National Standards Institute.
Attenuation	Signal power loss through equipment, lines or other transmission devices. Measured in decibels.
Balanced	A transmission line in which voltages on the two conductors are equal in magnitude, but opposite in polarity, with respect to ground.
Balanced Line	A circuit in which neither side of the line is grounded. This minimizes crosstalk or noise pickup between pairs in the same cable.
Baud	Unit of signaling speed equivalent to the number of discrete conditions or events per second. If each signal event represents only one bit condition, baud rate equals bps (bits per second).
Bit	The smallest unit of information in a binary system. Represents either a one or zero ("1" or "0").
Bridge	A device interconnecting local area networks at the OSI data link layer, filtering and forwarding frames according to media access control (MAC) addresses.
Buffer	A storage device. Commonly used to compensate for differences in data rates or event timing when transmitting from one device to another. Also used to remove jitter.
Byte	A group of bits (normally 8 bits in length).
Cell	The 53-byte basic information unit within an ATM network. The user traffic is segmented into cells at the source and reassembled at the destination. An ATM cell consists of a 5-byte ATM header and a 48-byte ATM payload, which contains the user data.
Channel	A path for electrical transmission between two or more points. Also called a link, line, circuit or facility.
Clock	A term for the source(s) of timing signals used in synchronous transmission.
Data	Information represented in digital form, including voice, text, facsimile and video.
dBm	A measure of power in communications: the decibel in reference to one milliwatt (0 dBm = 1 milliwatt and -30 dBm = .001 milliwatt).
Diagnostics	The detection and isolation of a malfunction or mistake in a communications device, network or system.

Encapsulation	Encapsulating data is a technique used by layered protocols in which a low level protocol accepts a message from a higher level protocol, then places it in the data portion of the lower-level frame. The logistics of encapsulation require that packets traveling over a physical network contain a sequence of headers.
Equalizer	A device that compensates for distortion due to signal attenuation and propagation time with respect to frequency. It reduces the effects of amplitude, frequency and/or phase distortion.
Ethernet	A local area network (LAN) technology which has extended into the wide area networks. Ethernet operates at many speeds, including data rates of 10 Mbps (Ethernet), 100 Mbps (Fast Ethernet), 1,000 Mbps (Gigabit Ethernet), 10 Gbps, 40 Gbps, and 100 Gbps.
Flow Control	A congestion control mechanism that results in an ATM system implementing flow control.
Frame	A logical grouping of information sent as a link-layer unit over a transmission medium. The terms packet, datagram, segment, and message are also used to describe logical information groupings.
Full Duplex	A circuit or device permitting transmission in two directions (sending and receiving) at the same time.
G.703	An ITU standard for the physical and electrical characteristics of various digital interfaces, including those at 64 kbps and 2.048 Mbps.
Gateway	Gateways are points of entrance and exit from a communications network. Viewed as a physical entity, a gateway is that node that translates between two otherwise incompatible networks or network segments. Gateways perform code and protocol conversion to facilitate traffic between data highways of differing architecture.
Half Duplex	A circuit or device capable of transmitting in two directions, but not at the same time.
Impedance	The combined effect of resistance, inductance and capacitance on a transmitted signal. Impedance varies at different frequencies.
Interface	A shared boundary, defined by common physical interconnection characteristics, signal characteristics, and meanings of exchanged signals.
IP Address	Also known as an Internet address. A unique string of numbers that identifies a computer or device on a TCP/IP network. The format of an IP address is a 32-bit numeric address written as four numbers from 0 to 255, separated by periods (for example, 1.0.255.123).
Jitter	The deviation of a transmission signal in time or phase. It can introduce errors and loss of synchronization in high speed synchronous communications.
Laser	A device that transmits an extremely narrow and coherent beam of electromagnetic energy in the visible light spectrum. Used as a light source for fiber optic transmission (generally more expensive, shorter lived, single mode only, for greater distances than LED).

Latency	The time between initiating a request for data and the beginning of the actual data transfer. Network latency is the delay introduced when a packet is momentarily stored, analyzed and then forwarded.
Loading	The addition of inductance to a line in order to minimize amplitude distortion. Used commonly on public telephone lines to improve voice quality, it can make the lines impassable to high speed data, and baseband modems.
Loopback	A type of diagnostic test in which the transmitted signal is returned to the sending device after passing through all or part of a communications link or network.
Manager	An application that receives Simple Network Management Protocol (SNMP) information from an agent. An agent and manager share a database of information, called the Management Information Base (MIB). An agent can use a message called a traps-PDU to send unsolicited information to the manager. A manager that uses the RADview MIB can query the RAD device, set parameters, sound alarms when certain conditions appear, and perform other administrative tasks.
Multimode Fiber	A fiber with a large core diameter; 50-200 microns compared with the wavelength of light. It therefore propagates more than one mode. With multimode fiber, light traverses multiple paths, some longer than others. This leads to dispersion, which reduces optical range.
Multiplexer	At one end of a communications link, a device that combines several lower speed transmission channels into a single high speed channel. A multiplexer at the other end reverses the process. Sometimes called a mux. See **Bit Interleaving/Multiplexing**.
Network	(1) An interconnected group of nodes. (2) A series of points, nodes, or stations connected by communications channels; the collection of equipment through which connections are made between data stations.
parameters	Parameters are often called arguments, and the two words are used interchangeably. However, some computer languages such as C define argument to mean actual parameter (i.e., the value), and parameter to mean formal parameter. In RAD CLI, parameter means formal parameter, not value.
Physical Layer	Layer 1 of the OSI model. The layer concerned with electrical, mechanical, and handshaking procedures over the interface connecting a device to the transmission medium.
Port	The physical interface to a computer or multiplexer, for connection of terminals and modems.
prompt	One or more characters in a command line interface to indicate that the computer is ready to accept typed input.
Protocol	A formal set of conventions governing the formatting and relative timing of message exchange between two communicating systems.

Routing	The process of selecting the most efficient circuit path for a message.
Single Mode	Describing an optical wave-guide or fiber that is designed to propagate light of only a single wavelength (typically 5-10 microns in diameter).
Sync	See **Synchronous Transmission**.
T1	A digital transmission link with a capacity of 1.544 Mbps used in North America. Typically channelized into 24 DS0s, each capable of carrying a single voice conversation or data stream. Uses two pairs of twisted pair wires.
T3	A digital transmission link with a capacity of 45 Mbps, or 28 T1 lines.
Telnet	The virtual terminal protocol in the Internet suite of protocols. It lets users on one host access another host and work as terminal users of that remote host. Instead of dialing into the computer, the user connects to it over the Internet using Telnet. When issuing a Telnet session, it connects to the Telnet host and logs in. The connection enables the user to work with the remote machine as though a terminal was connected to it.
Throughput	The amount of information transferred through the network between two users in a given period, usually measured in the number of packets per second (pps).

Quick Start Guide

If you are familiar with the Optimux-106, use this guide to prepare it for operation. Perform the following steps.

1. Connecting the Interface Cables

Connecting the Tributary T1 Interfaces

➤ To connect T1 interface (RJ-45 connector)

- Connect the RJ-45 connector of the cable to the T1 port.

Connecting the USER-ETH interface

➤ To connect the USER-ETH interface

- Connect the RJ-45 connector of the cable to the USER-ETH port.

Connecting the Uplink

➤ To connect the uplink

1. Clean the optical connectors using an approved solvent, and dry thoroughly using optical tissue.
2. Connect to the two optical connectors designated TX (transmit output) and RX (receive input) of the appropriate interface.
3. Pay attention to correct connection of the transmit and receive cables to the corresponding connectors. Avoid sharp bends and twisting of the fiber-optic cables.

Note *For WDM option, only one fiber optic cable per link should be connected.*

2. Connecting the Power

Warning

Before powering this unit and before connecting or disconnecting any other cable, the protective earth terminals of this instrument must be connected to the protective ground conductor of the mains (AC or DC) power cord. If you are using an extension cord (power cable) make sure it is grounded as well.

Any interruption of the protective grounding conductor (inside or outside the instrument) or disconnecting the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.

Connecting the AC/DC Power

The Optimux-106 is supplied with a Wide Range AC/DC power supply. The wide-range AC/DC power supply accepts current from both AC and DC sources. From an AC source, the power supply can receive any voltage in the range of 100 VAC to 240 VAC. From a DC source, the -48 VDC power supply can receive any voltage in the range of -40 to -72 VDC.

This unit is equipped with a standard AC-type 3-prong power input connector located on the unit rear panel. This power input connector can be used for both AC and DC voltage inputs. AC or DC power should be supplied to Optimux-106 through the 5-feet (1.5m) standard power cable terminated by a standard 3 prong plug.

➤ **To connect Optimux-106 to AC power:**

1. Connect the power cable to the connector on the Optimux-106 rear panel.
2. Connect the power cable to the electricity outlet.

Connecting the DC Power

When connecting the DC power, the PWR pin must be connected to the ungrounded line of the central battery (either – or +). The RTN pin must be connected to the grounded line of the central battery. The GND pin must be connected to the protected earth of the building installation.

Caution

The DC installation procedure must be performed by a qualified technician.

➤ **To connect Optimux-106 to -48 VDC power:**

- Refer to the DC power supply connection supplement, located on the Technical Documentation CD or at the back of the official printed version of this manual. Also, refer to the safety instructions at the beginning of this document.

3. Configuring the Optimux-106

Configuring IP Host Parameters

➤ To define the Host IP parameters:

1. From the Management menu, select **Host**.
2. From the Host menu, perform the following:
   - Select **IP Address** to define the host IP address
   - Select **IP Mask** to define the host IP mask
   - Select **Default Gateway** to set the default gateway IP address.

Note *The default gateway must be in the same subnet as the host.*

Configuring Control Port Parameters

➤ To configure the control port data rate:

1. From the Control Port menu (**Configuration>System>Control Port**), select **Baud Rate**.
2. Select the terminal rate by typing the number corresponding to the desired value, and then press <**Enter**>.
3. From the Control Port menu, select **Security Timeout** to set it to OFF or to 10 minutes.
4. From the Control Port menu, select **Pop Alarm** to set it to ON or to OFF.

Configuring the MNG-ETH port

➤ To configure the MNG-ETH port:

1. From the Configuration menu select **Physical Layer>Ethernet**.
2. Select **Device Number** to set the device location (local or remote).
3. Select **Port Number** to set the Fast Ethernet port number to **ETH-MNG**.
4. Select **Auto Negotiation** to toggle between the **Enabled** and **Disabled** options.
5. Select **Flow Control** to toggle between the **Enabled** and **Disabled** options.
6. Select **Alarms** to mask or unmask the Fast Ethernet alarms. This option identifies whether alarms triggered by this Ethernet port are masked or not. When masked, these alarms are not trapped and are not recorded in the log file.

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Chapter 1

Introduction

1.1 Overview

Optimux-106 is a second-order multiplexer that combines four T1 (1.544 Mbps) tributary data streams and an optional Ethernet (10/100 Mbps) data stream into a proprietary T2 data stream.

For the purpose of this manual, the term Optimux-106 is used for information applicable to both the T1 and Ethernet models. The terms Optimux-106-T1 and Optimux-106-ETH are used for information specific only to that model.

Product Options

Optimux-106 is available as a standalone unit with redundant fiber optic link, balanced tributary (four T1 links), and redundant power supply.

Optimux-106-ETH adds a USER Ethernet port to the standard Optimux-106 configuration.

Optimux-106 is available in a plastic or a metal enclosure.

Applications

The following figures illustrate typical applications of the Optimux-106 unit.

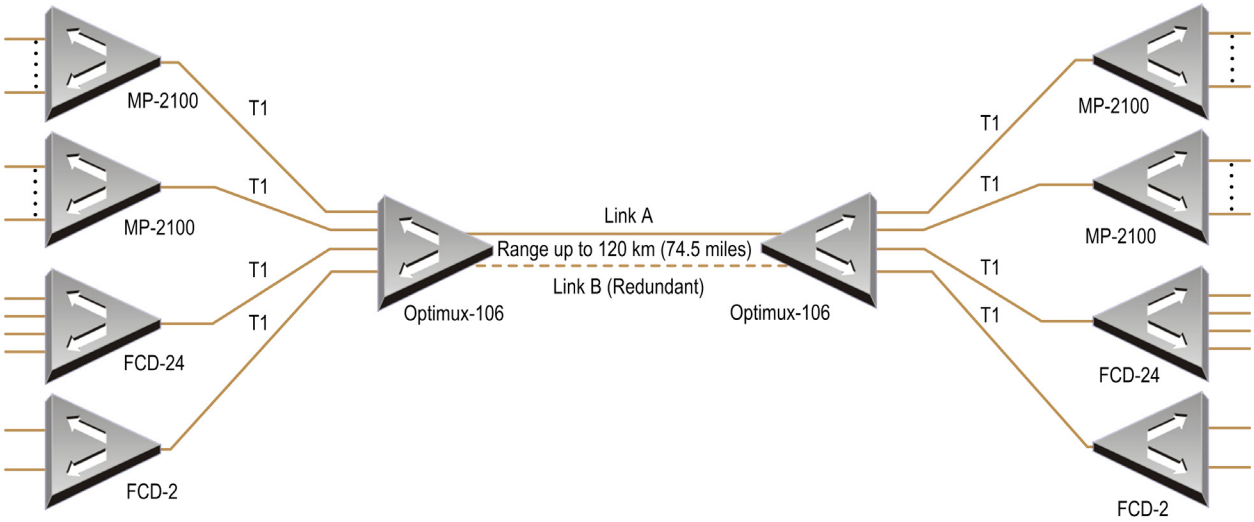


Figure 1-1. Typical Optimux-106 Application

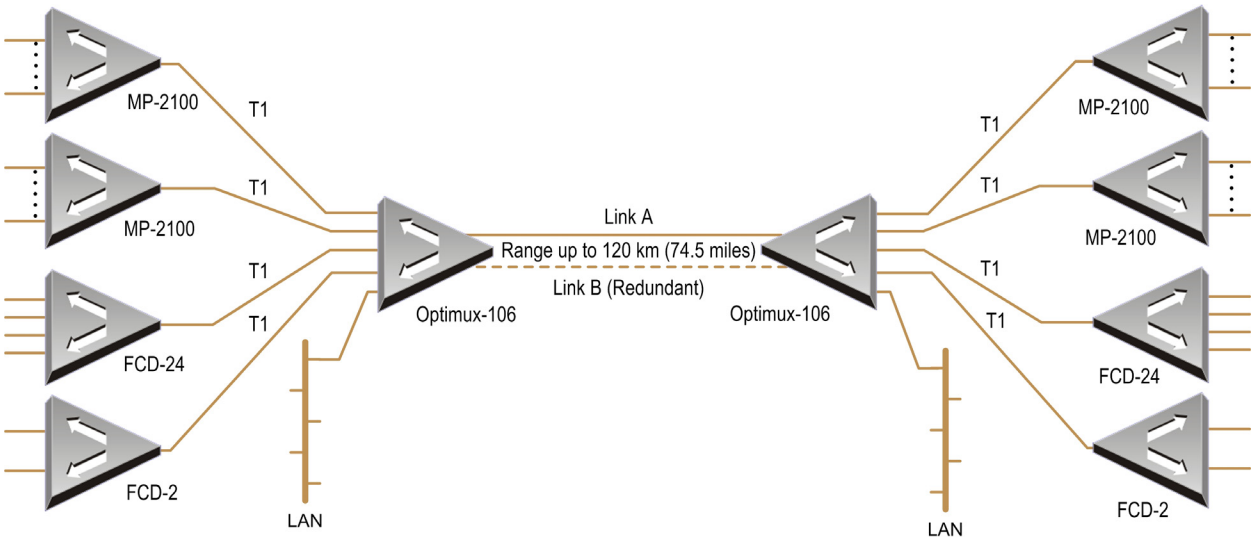


Figure 1-2. Typical Optimux-106 with USER ETH Application

Features

Optimux-106 is a compact 1U high, ½ 19-inch wide unit that multiplexes four T1 channels and an optional 10/100BaseT USER Ethernet port over a T2 fiber optic uplink.

The unit transmits over multimode, single-mode, or single mode over single fiber (WDM) using LED, VCSEL, or laser diode transmitters for a range up to 120 km (74.5 miles).

Optimux-106 can be ordered with two uplink interfaces, where the second link interface operates as a backup for the main link. The user can select automatic switching to the backup or manual selection of the desired link interface.

Optimux-106 can be powered from 100-240 VAC or -40 to -72 VDC power supplies. Two independent power supplies can be installed for redundancy.

The device can be managed using an ASCII terminal, an SNMP management station, or an Ethernet link using Telnet or a Web-based management interface.

Optimux-106 conforms to the following standards: ITU G.703, G.824, G.955, IEEE 802.3.

1.2 Physical Description

Figure 1-3 shows a 3D view of the Optimux-106 unit in the plastic enclosure. The plastic enclosure is a compact 1U high, ½ 19-inch wide unit. The location of LEDs and connectors on the metal enclosure is similar.

The front panel includes several LEDs, which display the status of power, data flow and diagnostics. For a detailed description of the front panel, see *Chapter 3*.

Figure 1-3 Optimux-106 Front Panel

The rear panel includes receptacles for connecting AC or DC power, four tributary ports, two uplinks, a control port, an alarm relay port, a management Ethernet port and a User Ethernet port (If ordered) as well as various indicator LEDs. The Optimux-106 rear panel is fully described in *Chapter 2*.

1.3 Functional Description

Printed Circuit Boards

Optimux-106 contains the following printed circuit boards:

- Main board, including one tributary interface (with 4 RJ-45 connectors)
- One or two uplink interface boards (A and B)
- USER Ethernet port up to 75 Mbps
- One or two power supplies (A and B):
  AC/DC wide-range power supply (100-240 VAC or -40 to -72 VDC)

Uplink Interface Characteristics

The fiber optic interface provides a secure link in hazardous or hostile environments, increasing the maximum connection range, and achieving immunity against electrical interference and protection against the harmful effects of ground loops. The fiber optic uplink interface complies with the requirements of ITU-T Rec. G.955, and uses a proprietary signaling format that ensures optimum performance. To optimally meet a wide range of system requirements, the fiber optic interface can be ordered for operation over 62.5/125 micron multimode fibers (typical attenuation 3.5 dB/km at 850 nm), as well as over low-loss 9/125 micron single mode fibers (typical attenuation 0.4 dB/km at 1310 nm, and 0.25 dB/km at 1550 nm).

The fiber optic interface is hot swappable, allowing for quick and easy replacement in the field.

Table 1-1 provides information on the characteristics of the optical subsystem, including the maximum range over typical fiber optic cable. The maximum range values given in the table below assume a margin of 3 dB.

Table 1-1 Fiber Optic Interface Characteristics

Wavelength [nm]	Fiber Type [μm]	Transmitter Type	Typical Output Power [dBm]	Receiver Sensitivity [dBm]	Typical Max. Range [km miles]		Connector Type
850	62.5/125 multimode	Laser (VCSEL)	-6	-34*	4.5	2.8	ST, SC, FC/PC
1310	9/125 single mode	Laser	-12	-34	47	29.2	ST, SC, FC/PC
1310	62.5/125 multimode	LED	-18	-32	7	4.3	ST, SC
1310	9/125 single mode	Laser [long haul]	-2	-34	72	44.7	ST, SC, FC/PC
1310 Transmit/Receive	9/125 single mode Single fiber	Laser [SF3]	-12	-27	20	12.4	SC/APC only
1310/1550 Transmit/Receive	9/125 single mode Single fiber	Laser WDM [SF1]	-12	-34	47	29.2	SC
1550/1310 Transmit/Receive	9/125 single mode Single fiber	Laser WDM [SF2]	-12	-34	47	29.2	SC
1550	9/125 single mode	Laser	-12	-34	76	47.2	ST, SC, FC/PC
1550	9/125 single mode	Laser [long haul]	-2	-34	120	74.5	ST, SC, FC/PC

** The Receiver Sensitivity for units with the Ethernet port is 32 dBm.*

All fiber optic interface options offer high performance and have a wide dynamic range.

The SF3 option uses an SC/APC connector. The FO cable connected to it must therefore be of the same type.

Uplink Redundancy Option

Optimux-106 can be ordered with one or two link interface options. Each interface operates independently, and can be ordered from the link options listed above.

In the uplink redundancy option, Optimux-106 supports fully automatic switching between the main and the backup link. The main link has priority, therefore normally it is selected for use, and the backup link is disabled. In case a failure occurs on the main link, Optimux-106 automatically switches to the backup link and continues providing normal service. After the main link returns to normal operation, it is automatically reselected.

Each link interface has its own set of indicators that display the current state of the link. AIS alarm does not appear for the non-active optical link.

Tributary Interface Characteristics

The Optimux-106 tributary interfaces meet the requirements of ITU-T Rec. G.703.

The tributary ports (1-4) are 100Ω balanced line interface, terminated in an RJ-45 8-pin connector.

Line coding is B8ZS or AMI. The nominal balanced interface transmit level is ±3V. The maximum line attenuation is up to 6 dB, and each T1 signal is processed by an adaptive equalizer that compensates for various cable lengths to ensure optimal performance. Phase locked loops (PLL) are used to recover the clock signals, and the resulting jitter performance complies with the requirements of ITU-T Rec. G.824.

Each tributary interface has its own set of indicators that show the current state of the tributary link. The user can disable the alarm indications generated by unused interfaces. AIS data streams are transmitted instead of failed or unconnected tributary data streams.

Ethernet User Interface Characteristics

The optional Ethernet user port is 10/100BaseT interface with throughput of up to 75Mbps, full and half-duplex capabilities, autonegotiation, flow control, complying with the 802.3 standard. It supports an MDI/MDIX connection.

Though USER-ETH port has 100 Mbps capability it achieves 75% utilization only.

Test and Diagnostics Capabilities

Optimux-106 has comprehensive test and diagnostic capabilities that include local and remote loopbacks on the uplink and on each tributary link interface. Maintenance is further enhanced by an automatically performed self-test on power up.

For activating loopbacks, see *Chapter 4*.

Alarms and Alarm Indications

Optimux-106 detects the following alarm conditions on each T1 and uplink interface:

- Loss of input signal
- Loss of frame synchronization (on uplink only)
- Reception of alarm indication (AIS) signal, which consists of a continuous sequence of 1s (on the tributary only).

- *When AIS is received, loss of frame synchronization occurs. However, in this case the loss of frame synchronization alarm is suppressed.*
- *AIS alarm will not appear for the non-active optical link.*

When not all the tributaries are in use, the user can disable the alarm indications related to the unused tributaries through the software (see *Chapter 4*).

The response to alarm conditions is as follows:

- AIS is transmitted on each tributary output in the following cases:
  - Loss of uplink input signal is detected
  - Uplink frame synchronization is lost
  - AIS is received on the uplink input
  - Remote Loopback is activated on the uplink input
- An AIS signal is sent on a tributary instead of the tributary data stream through the uplink in the following cases:
  - Loss of tributary input signal is detected
  - AIS is received on the tributary input
  - Local Loopback is activated on the T1 input

An optional dedicated rear panel connector is used to provide major and minor alarm indications, by means of dry contacts.

The major alarm is activated in the following cases:

- Optimux-106 is not powered, or total power supply failure (e.g., when two power supplies are installed, failure of both supplies)
- Loss of uplink input signals, or loss of uplink frame synchronization
- Signal loss at backup link while Link Redundancy mode is Automatic/Manual
- One of two power supplies is failed (optional, if both power supplies are mounted)
- Loss of tributary input signals
- Redundancy mode is Automatic/Manual, but backup link is not installed
- Unable to activate redundancy
- MNG-ETH link failed
- USER-ETH link is failed
- Connection with the remote device is lost

The minor alarm is activated in the following cases:

- Reception of AIS signal on tributary inputs.

Events

Optimux-106 supports the following events that are shown in the Event Log:

- Failed in processing software download
- Event log buffer has exceeded the maximum size and new events are written over the old ones
- Login was performed to the unit
- Trying to login to the unit with wrong user name or password
- Read/write via SNMP with wrong community
- Unit is powered up
- Uplink is switched from A to B and vice versa

Management and Monitoring

Optimux-106 units are equipped with a control port (CONTROL) and an Ethernet management port (MNG-ETH) located on the rear panel. The MNG-ETH port operates at a rate of 10/100 Mbps and can be set to 10/100 full- or half-duplex, with or without autonegotiation. It supports flow control and an MDI/MDIX connection.

The management interface supports the following management methods:

- Supervision Terminal – An ASCII terminal connected to the control port (or a PC running a terminal emulation program) can be used as a supervision terminal. All software required for the various management functions available through the terminal is contained in the Optimux-106.
- SNMP Management – A built-in SNMP agent that enables SNMP management of the Optimux-106 via the MNG-ETH connector. The SNMP agent enables fully graphical, user-friendly management using RADview stations offered by RAD, as well as management by other SNMP-based systems.
- WEB Management – Optimux-106 has an option to be connected via management port (MNG-ETH connector) that is supported by TCP/IP protocol, and can be connected to the Ethernet network port
- Telnet Management – Optimux-106 has an additional option to be managed by Telnet.

Physical Characteristics

Optimux-106 is a compact unit, intended for installation on desktops or shelves. Unit height is 1U (1.75 inch). An optional rack-mount adapter kit enables installation of Optimux-106 in a 19-inch rack.

Power Requirements

Optimux-106 can be ordered with one or two AC/DC wide-range power supplies for operation on AC (100-240 VAC) or on DC (-40 to -72 VDC) sources.

Each power supply (A and B) can be ordered as one of the above power supply types.

When two power supplies are installed, they share the load. If one of the power supplies fails or its input power is disconnected, the other power supply continues providing power to Optimux-106.

1.4 Technical Specifications

Uplink Interface	*Number of Links*	One or two (A and B)
	Type	Optical
	Applicable Standards	ITU-T Rec. G.955
	Performance	Refer to *Table 2-1*
	Connectors	ST, SC, or FC-PC, ordered option (SF1/SF2 options only available with SC) (SF3 option only available with SC/APC)
T1 Tributary Interface	*Applicable Standards*	ITU-T Rec. G.703, G.824
	Nominal Line Data Rate	1544 kbps
	Line Code	B8ZS or AMI
	Line Length (ft)	Five options for line length definition: 0-133, 134-266, 267-399, 400-533, 534-655 ft
	Bit Rate Tolerance	±25 ppm
	Line Impedance	100Ω (balanced)
	Connectors	Balanced interface: RJ-45 connector
	Transmit Level:	
	RJ-45	±3V (±10%)
User Ethernet Port	*Physical Interface*	10/100BaseT
	Transmission Mode	• Full/half-duplex • Auto-negotiation enable/disable • Flow Control and Backpressure enable/disable

	Bridge Parameters	• 1K supported addresses • Supported frame size: up to 1535 bytes • Throughput: up to 111610 pps (75 Mbps data transfer rate, 64-byte frames) • Latency: 30 µsec (100 Mbps data transfer rate, 64-byte frames) • Compatible with IEEE 802.3, 802.3x, 802.3u, 802.1p • Fault propagation in LAN in case of WAN error (optional)
	Connector	RJ-45
Signal Levels	*Receive Levels*	0 dB to -6 dB
Jitter Performance		Per ITU-T Rec. G.824
Control Port	*Physical Interface*	RS-232 DCE Asynchronous
	Data Rate	9.6, 19.2, 38.4, 57.6, 115.2 kbps
	Connector	Mini-USB 5
MNG-ETH Port	*Physical Interface*	10/100BaseT
	Data Rate	10/100 Mbps
	Transmission Mode	Full/half duplex Auto-negotiation enable/disable Flow control and back pressure enable/disable
	Connector	Shielded RJ-45
	Cable Type	UTP-CAT-5
Alarm Relay	*Connector*	Shielded RJ-45
	Contact Functions	Set of floating normally-closed/normally open contacts for major and minor alarm indication
	Contact Rating	Maximum 0.5A (at 30 VDC or 30 VAC) through closed contacts

Physical	***Plastic Enclosure***	
	Height	4.37 cm (1.7 in) (1U)
	Width	21.7 cm (8.5 in)
	Depth	17.0 cm (6.7 in)
	Weight	0.5 kg (1.1 lb)
	Metal Enclosure	
	Height	4.73 cm (1.8 in)
	Width	21.5 cm (8.4 in)
	Depth	15.25 cm (6.0 in)
	Weight	0.7 kg (1.5 lb)
Power	*AC/DC Powered Units*	100 to 240 VAC, 50 or 60 Hz, 25 VA -or- -40 to-72 VDC 9W
Environment	*Operating Temperature*	0° to 50°C (32° to 122°F)
	Relative Humidity	Up to 90%, non-condensing

Chapter 2

Installation and Setup

Optimux-106 is delivered completely assembled. It is designed for operation as a desktop unit or for mounting in a 19-inch rack. For instructions on rack mounting, refer to the *Rack Mounting Kit for 19-inch Racks* guide that comes with the RM kit.

Mechanical and electrical installation procedures for Optimux-106 are provided in the following sections.

After installing the unit, refer to *Chapter 3* for system operating instructions.

In case a problem is encountered, refer to *Chapter 5* for test and diagnostics instructions.

Warning

No internal setting, adjustment, maintenance, or repairs may be performed by either the operator or the user; such activities may be performed only by a skilled technician who is aware of the hazards involved.

Always observe standard safety precautions during installation, operation, and maintenance of this product.

Note

Before installing the product, review Handling Energized Products at the beginning of the manual.

2.1 Site Requirements and Prerequisites

Power

Install Optimux-106 units powered by the wide-range AC/DC power within 1.5m (5 feet) of an easily accessible grounded AC outlet capable of furnishing a supply voltage in the range of 100-240 VAC or -40 to -72 VDC.

Tributary Connections

The tributary interface has four RJ-45 connectors. If ordered, there is an RJ-45 connector for the USER-ETH port. *Appendix A* shows the pin allocation for the RJ-45 connectors.

The maximum allowable line attenuation between each tributary port and the user's equipment is 6 dB.

Uplink Connections

Each fiber optic uplink interface is terminated in two ST, SC, FC/PC, or SC/APC connectors, in accordance with the customer's order. The maximum allowable attenuation depends on the interface option ordered (refer to *Table 1-1*).

When working with the WDM option, connect only one fiber optic cable per link. SF1 must work opposite SF2. SF1 cannot work opposite SF1, and SF2 cannot work opposite SF2.

Front and Rear Panel Clearance

Allow at least 90 cm (36 inches) of clearance in the front for operator access. Allow at least 10 cm (4 inches) clearance in the rear for interface cable connections.

Avoid sharp bends when planning the routing of fiber optic cables.

Ambient Temperature

The ambient operating temperature of the Optimux-106 is 0° to 50°C (32 to 122°F), at a relative humidity of up to 90%, non-condensing.

2.2 Package Contents

The Optimux-106 package contains the following:

- Optimux-106 multiplexer unit
- AC power cable (two cables when ordered with redundant power supply)
- DC adapter plug (if a DC power supply is ordered)
- Control port cable: CBL-MUSB-DB9F
- Alarm port cable: CBL-RJ45-DB9/F
- RM-33-2 rack mount kit for the plastic enclosure unit (if ordered)
- RM-35 or WM-35 rack mount kits for the metal enclosure unit (if ordered)
- Technical documentation CD.

2.3 Required Equipment

The following equipment is required to install Optimux-106:

- Fiber optic cables (for optical uplink interface)
- RJ-45 T1 connector cables (for balanced tributary interface)
- RJ-45 Ethernet connector cable category 5
- Philips screwdriver (for installation in 19-inch rack).

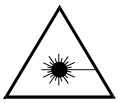
2.4 Mounting the Unit

Optimux-106 is designed for installation as a desktop unit. It can also be mounted in a 19" rack. For rack mounting instructions, refer to the RM-33-2 installation kit manual that comes with the RM kit for plastic enclosure unit and RM-35 or WM-35 rack mount kits for the metal enclosure unit.

If Optimux-106 is to be used as a desktop unit, place and secure the unit on a stable, non-movable surface.

Refer to the clearance and temperature requirements in *Site Requirements and Prerequisites*.

2.5 Connecting the Interfaces



Warning

Eye damage may be caused by a broken or unterminated fiber optic or connector if the laser beam is viewed directly or with improper optical instruments. The laser beam is invisible.

Warning

Access to the inside of the equipment is permitted only to qualified and authorized service personnel.

Disconnect the unit from the power line and from all the cables before removing cover.

Warning

Dangerous high voltages are present inside the Optimux-106 when it is connected to power and/or to the links. Moreover, under external fault conditions, dangerous high voltages may appear on the lines connected to the Optimux-106.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, would be carried out only by a skilled technician who is aware of the hazard involved. Capacitors inside the instrument may still be charged even after the instrument has been disconnected from its source of supply.

Caution

Optimux-106 contains components sensitive to electrostatic discharge (ESD). To prevent ESD damage, avoid touching the internal components.

Warning

Optimux-106 includes Class 1 lasers. For your safety:

- Do not look directly into the optical connectors while the unit is operating. The laser beams are invisible.
- Do not attempt to adjust the laser drive current.

The use of optical instruments with this product will increase eye hazard. Laser power up to 1 mW at 1300 nm and 1550 nm could be collected by an optical instrument.

Use of controls or performing procedures other than those specified herein may result in hazardous radiation exposure.

Connector Location

The following figures show the typical Optimux-106 rear panels. Connector pin allocations appear in *Appendix A*.

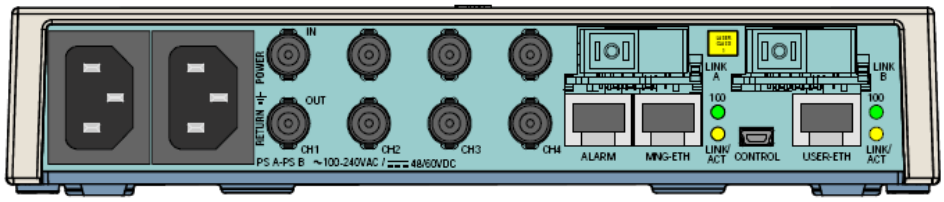


Figure 2-1 Plastic Enclosure, Ethernet User Port and Unbalanced T1 Tributaries

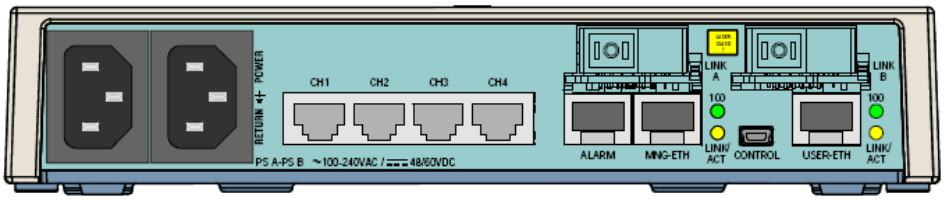


Figure 2-2. Plastic Enclosure, Ethernet User Port and Balanced T1 Tributaries

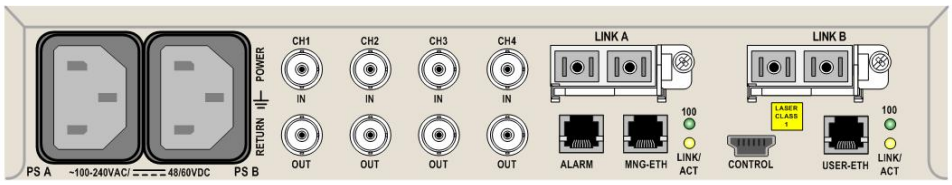


Figure 2-3 Metal Enclosure, Ethernet User Port and Unbalanced T1 Tributaries

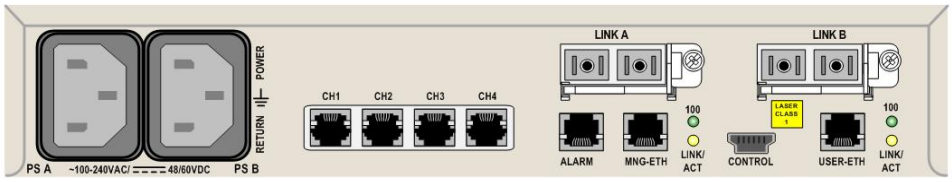


Figure 2-4. Metal Enclosure, Ethernet User Port and Balanced T1 Tributaries

Connecting to Channels

The tributary interfaces include four RJ-45 connectors.

➤ **To connect the tributary connectors:**

- Connect each of the tributary cables to the RJ-45 connector(s) designated CH1, CH2, CH3, or CH4, respectively.

Connecting to Ethernet Network

The User Ethernet port includes one RJ-45 connector used to connect to the Ethernet network equipment.

➤ **To connect to the Ethernet network equipment:**

1. Connect the RJ-45 Ethernet cable to the Ethernet network equipment.
2. Connect the other side of the RJ-45 Ethernet cable to the USER-ETH port.

Connecting to Uplink Equipment

Connect the uplink (A and B) using two groups of connectors, one for Link A and the other for optional Link B. Use ST, SC, FC/PC or SC/APC connectors as relevant.

For each uplink interface (A and B), connect as follows:

➤ To connect the uplink:

1. Clean the optical connectors using an approved solvent, and dry thoroughly using optical tissue.
2. Connect to the two optical connectors designated TX (transmit output) and RX (receive input) of the appropriate interface.
3. Verify the correct connection of the transmit and receive cables to the corresponding connectors. Avoid sharp bends and twisting of the fiber-optic cables.

Note *For the WDM option, connect only one fiber optic cable per link.*

Connecting to Alarm Relay

This connector connects the changeover contacts of the major and minor alarm relays.

➤ To connect the alarm connector:

- Connect the alarm relays via the ALARM connector (RJ-45) located on the rear panel.

Note *Connection of the alarm port is made using a special cable, RJ45 to DB9/female,* ***CBL-RJ45-DB9/F.***

Connecting to DCE

This connector connects the RS-232 serial port of the station to the DCE interface on the board.

➤ To connect the control connector:

- Connect the control cable to the mini USB connector at the rear panel and to the DCE device.

Note *Connection of the control port is made using a special cable, Mini-USB to DB9/female,* ***CBL-MUSB-DB9F***

Connecting to Management Station

The Optimux-106 user interface terminates in an 8-pin RJ-45 connector.

➤ To connect the user Ethernet Management Port:

- Connect the management station to the MNG-ETH connection using a UTP-CAT5 cable.

2.6 Grounding

Connect the protective ground to the ground pin of the power connector for both the AC and DC versions.

Warning

This instrument may become dangerous if damage to the protective (grounding) conductor (inside or outside the instrument) occurs or if disconnecting the protective ground terminal.

Before connecting any cable, the protective ground terminals of this instrument must be connected to the protective ground conductor of the power cord. The power plug shall only be inserted in a socket outlet provided with a protective ground contact. The protective action must not be negated by use of an extension cord (power cable) without a protective conductor (grounding).

Warning

Whenever it is likely that the protection offered by fuses has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

The wide-range AC/DC power supply inside Optimux-106 accepts current from both AC and DC sources. From an AC source, the power supply can receive any voltage in the range of 100-240 VAC. From a DC source, the -48 VDC power supply can receive any voltage in the range of -40 to -72 VDC.

When connecting the DC power, the PWR pin must be connected to the ungrounded line of the central battery (either – or +). The RTN pin must be connected to the grounded line of the central battery. The GND pin must be connected to the protected earth of the building installation.

Caution

A qualified technician must perform the DC installation procedure.

2.7 Connecting to Power

Optimux-106 is supplied with a Wide Range AC/DC power supply. This unit is equipped with a standard AC-type 3-prong power input connector located on the unit rear panel. This power input connector can be used for both AC and DC voltage inputs. AC or DC power should be supplied to Optimux-106 through the 5-feet (1.5m) standard power cable terminated by a standard 3-prong plug.

➤ **To connect to AC power:**

1. Connect the power cable to the connector on the Optimux-106 rear panel.
2. Connect the power cable to the electric outlet.

➤ To connect to -48V DC power:

- Refer to the DC power supply connection supplement, located on the Technical Documentation CD or at the back of the official printed version of this manual. Also, refer to the safety instructions at the beginning of this document.

Caution

The DC installation procedure must be performed by a qualified technician.

Chapter 3

Operation

3.1 Turning On Optimux-106

➤ **To turn on an Optimux-106 unit with a single power supply:**

1. Connect the power cable to the power connector on the rear panel of the Optimux-106.
2. Connect the power cable to the electric outlet.

   The PWR indicator lights in green.

➤ **To turn on an Optimux-106 unit with two power supply units:**

1. Connect each power cable to a power connector on the Optimux-106 rear panel.
2. Connect each power cable to the electricity outlet.

   The PWR indicator lights in green.

During normal operation:

- The PWR indicator lights in green
- The indicator corresponding to the uplink in use, A or B, lights
- All SYNC LOSS front-panel indicators are turned off.

3.2 Indicators

Front Panel Indicators

Figure 3-1 shows the Optimux-106 front panel. *Table 3-1* lists the functions of the front panel indicators.

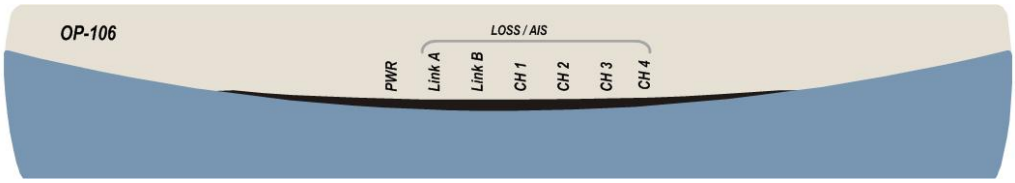


Figure 3-1 Optimux-106 Front Panel – Plastic Enclosure

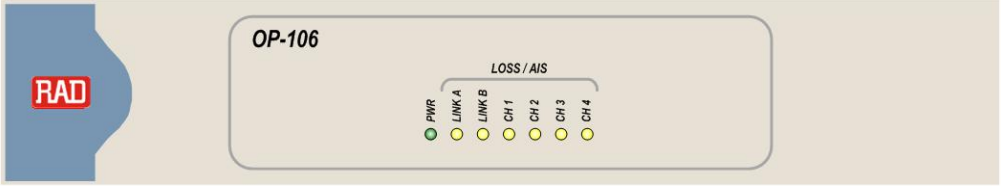


Figure 3-2. Optimux-106 Front Panel – Metal Enclosure

Table 3-1. Optimux-106 Indicators

LED Function	Color	Meaning
PWR	Green	Power supplies A and B are functioning correctly or PSA is good and PSB is not installed or PSB is good and PSA is not installed
	Red	PSA exists but is faulty
	Yellow	PSB exists but is faulty
	Off	Power is Off
Link A	Red	Signal loss or sync. loss detected
	Yellow	AIS detected (Optimux-106-T1 version only)
	Off	Normal operation – no alarm is detected, or power is Off
Link B	Red	Signal loss or sync. loss detected
	Yellow	AIS detected (Optimux-106-T1 version only)
	Off	Normal operation – no alarm is detected, or power is Off
CH1	Yellow	AIS detected on T1 Ch1
	Red	Signal loss detected on T1 CH1
	Off	Normal oparation – no alarm is detected or power is Off
CH2	Yellow	AIS detected on T1 Ch2
	Red	Signal loss detected on T1 CH2
	Off	Normal oparation – no alarm is detected or power is Off
CH3	Yellow	AIS detected on T1 Ch3
	Red	Signal loss detected on T1 CH3
	Off	Normal oparation – no alarm is detected or power is Off
CH4	Yellow	AIS detected on T1 Ch4
	Red	Signal loss detected on T1 CH4
	Off	Normal oparation – no alarm is detected or power is Off

Rear Panel Indicators

Figure 3-2 shows the typical Optimux-106 Rear panel. *Table 3-2* lists the functions of the Rear panel indicators.

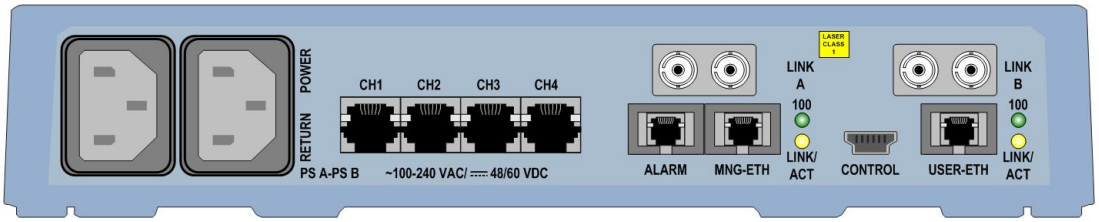


Figure 3-3. Optimux-106 Rear Panel – Plastic Enclosure

Table 3-2. Optimux-106 Rear Panel Indicators

LED Function	Color	Meaning
USER ETH: LINK/ACT	Yellow	On - USER link is up
(Optimux-106 ETH version only)	Blinking yellow	USER link is up and Rx and/or Tx frames are being transmitted
	Yellow	Off – USER link is down
USER ETH: 100 (Optimux-106 ETH version only)	Green	On – 100M mode Off – 10M mode
MNG ETH: LINK/ACT	Yellow	On - Management link is up
	Blinking yellow	Management link is up and Rx and/or Tx frames are being transmitted
	Yellow	Off – Management link is down
MNG. ETH: 100	Green	On – 100M mode Off – 10M mode
SIG Located on the bottom of the fiber optic module	Green	On – Signal is detected on fiber optic module Off – signal not detected

3.3 Default Settings

Table 3-3 lists the default settings of the Optimux-106 configuration parameters.

Table 3-3. Default Settings

Type	Parameter	Default Value
System		
Device Information	Name	Optimux-106

	Location	The Location of the Device
	Contact Person	Name of Contact Person
Host	IP address	0.0.0.0
	IP mask	0.0.0.0
	Default gateway	0.0.0.0
	Read Community	public
	Write Community	private
	Trap Community	public
Management Access	Telnet	All
	SNMP	All
	Web	All
Control Port	Baud rate	115200
	Security timeout	10
	Pop alarms	Off
Fault Propagation		Off
Alarms	Device	Local
	Alarms	Unmasked
	Remote Connection Fall	Unmasked
Redundancy	Force Link	Link A
	Mode	Auto
Physical Layer		
Ethernet	Device Number	Local
	Port Number	MNG-ETH
	Port Name	-
	Autonegotiation	Enable
	Flow Control	Enable
	Alarms	Unmasked
Link	Device Number	Local
	Port Number	Link A
	Port Name	-
	Alarms	Unmasked
T1	Device Number	Local
	Port Number	1
	Port Name	-
	Alarms	Unmasked
Diagnostics	Device Number	Local

Link Loop type	No Loop
Link LLB loop timeout (min) [1-255]	5
Channel's Loops	No Loop

3.4 Configuration and Management Alternatives

Optimux-106 can be managed in the following ways:

- ASCII Terminal – connected to Optimux-106 via the control port
- Telnet – access to the configuration screens via any Telnet application
- RADview – RAD's user-friendly SNMP-based GUI application, or by other SNMP-based management application.

Use the terminal menus to set and view configuration parameters. *Figure 3-6* illustrates the main menu and its submenus. Use this tree as a reference aid while performing configuration and control functions. Refer to *Chapter 4* and *Chapter 5* to find specific parameters.

Working with an ASCII Terminal

Connect the ASCII terminal directly to the Optimux-106 control port using the special cable provided with the product.

Use any standard ASCII terminal (a dumb terminal, or a PC running a terminal emulation application) that is equipped with a V.24/RS-232 communication interface to set up and configure Optimux-106.

➤ **To connect to a control terminal:**

1. Make sure that all Optimux-106 connectors are properly connected to the appropriate media.
2. Turn on the control terminal PC and set its default port parameters to 115,200 bps baud, 8 bits/character, 1 stop bit, no parity, flow control: none.
3. Set the terminal emulator to VT100 emulation for optimal view of system menus.
4. If you are using Hyper Terminal, set the terminal mode to 132-column mode for optimal view of system menus (**Properties** > **Settings** > **Terminal Setup** > **132 column mode**).
5. Power-up Optimux-106.

   At the end of the test, the PWR LED on the front panel lights green.

Logging In

To gain access to the main menu you must first log in.

Entering the User Name and Password

In the password prompt screen (below), you are required to enter a user name and password in order to start the Optimux-106 management software.

To prevent unauthorized modification of the operating parameters, Optimux-106 supports two access levels:

- A **superuser** can perform all the activities supported by the Optimux-106 management facility, including defining new users.
- A **user** has access rights (**full control** or **read only**) defined by the superuser. Users are not allowed to create new users.

1. After the SW finishes uploading, press **Enter** a few times.

   "..." appears.

2. Press <.> a few times until the following Password Prompt screen appears. (This synchronizes the baud rate of the terminal to the setup configuration).

```
                          Optimux-106

USER NAME:  SU
PASSWORD:   ****

ESC - clear; & - exit;                                  1 User(s)
```

Figure 3-4. Password Prompt Screen

Note *It is recommended to change default passwords to prevent unauthorized access to the unit.*

➤ **To enter as a superuser:**

1. Type **su** for the user name and press <**Enter**>.
2. Type **1234** for the password and press <**Enter**>.

This allows you to configure all the parameters of Optimux-106, and to change the *su* and *user* passwords.

➤ **To enter as a user:**

1. Type **user** for user name and press <**Enter**>.
2. Type **1234** for password and press <**Enter**>.

➤ **To set all passwords to the default values (1234):**

- Log in as **su** and delete the unit's configuration through the configuration screens.

Choosing Options

Local configuration and monitoring operations can be performed using an ASCII terminal connected to the control port. The following functions are supported:

- View system information

- Modify configuration and mode of operation, including setting system default values
- View statistics and status
- Perform diagnostics.

Remote site configuration and system monitoring, including troubleshooting procedures, can also be performed using Telnet or an SNMP application (e.g., RADview-HPOV/TDM).

Refer to *Figure 3-4* as a sample generic screen, to set up and configure Optimux-106. Not all screen elements appear on all the screens.

- Link to a submenu, such as 1 or 2 on the sample screen. To reach a submenu, select either 1 or 2 and press <**Enter**>
- Enter a value for a parameter (item 3). To enter a value, type 3, press <**Enter**>, type the value and press <**Enter**>.
- Select a value from a list (item 4). To select a value, type 4, press <**Enter**>, select the value from the list and press <**Enter**>.
- A value is changed by choosing a parameter (item 5) and pressing <**Enter**>.

The **Save** command is shown only when at least one menu item has been changed. Illegal changes, such as a parameter out of range, disable Save.

The area at the bottom of the screen is allocated for online messages. These messages carry online interactive user information containing configuration instructions and failure information with possible reasons of the failure.

Navigating Tables

Terminal hot keys are provided per screen to enhance the functionality that is required of that screen. The available hot keys are listed in the lower part of each screen. The following hot keys are system keys, available on screens:

Esc	Return to previous menu
!	Return to the main menu
&	Exit to password screen (to prevent unauthorized access after completing the session)
X or **x**	Next item
F or **f**	Forward interval (statistic menus)
B or **b**	Rearward interval (statistic menus)
@ - Full Screen	Allocate full screen for messages
D	Down
U	Up (monitoring-->system screens)
Tab	Select the next changeable cell
L	Move left
R	Move right
S <row No.><column No.>	Select cell.

The path at the top of the screen after the "Title" line indicates the menu path for reaching the currently displayed menu from the Main menu (for example: Main > Configuration > System).

Functional Screen Example

The following figure shows a typical generic sample screen, with main items displayed.

```
Title line (For example: Optimux-106
Configuration>System (for example)
1. Sub Menu                      >
2. Sub Menu                      >
3. Parameter X [Range]           (value)
4. Parameter Y                   (Select value from the list)
5. Parameter Z                    > (value that can be changed by pressing
                                     Enter after choosing this line)

prompt>
Instruction line message : (Please select item <1 to 4>, for example).

Help line message
Parameter help line such as "Esc" to return to previous menu

-----------Division screen line ------------------
Scroll message are
```

Figure 3-5. Sample Functional Screen

Help Screen Example

The following figure shows a typical Help screen, which summarizes the keyboard shortcuts that are available in the functional screen from which the Help screen was invoked.

The Help screen is invoked by pressing SHIFT-/ (the '**?**' symbol) '**?**' (SHIFT-/) from the relevant functional screen. However, not all functional screens have Help available.

```
Table Hot Keys

'L'  - move left
'R'  - move right
'D'  - move down
Tab  - select next changeable cell

S <row number>,<col number> - select cell

Press any key . . .
```

Figure 3-6. Typical Help Screen

Working with RADview-EMS

RADview-EMS is a user-friendly and powerful SNMP-based element management system (EMS), used for planning, provisioning, and managing heterogeneous networks. RADview-EMS provides a graphical user interface for monitoring RAD products via their SNMP agents.

RADview-EMS for Optimux-106 is bundled in the RADview-EMS/TDM package for PC (Windows-based) or Unix.

For more details about this network management software, and for detailed instructions on how to install, set up, and use RADview, contact your local distributor or refer to the RADview-EMS User's Manual, located on the Technical Documentation CD or on RAD's Web site.

3.5 Menu Map

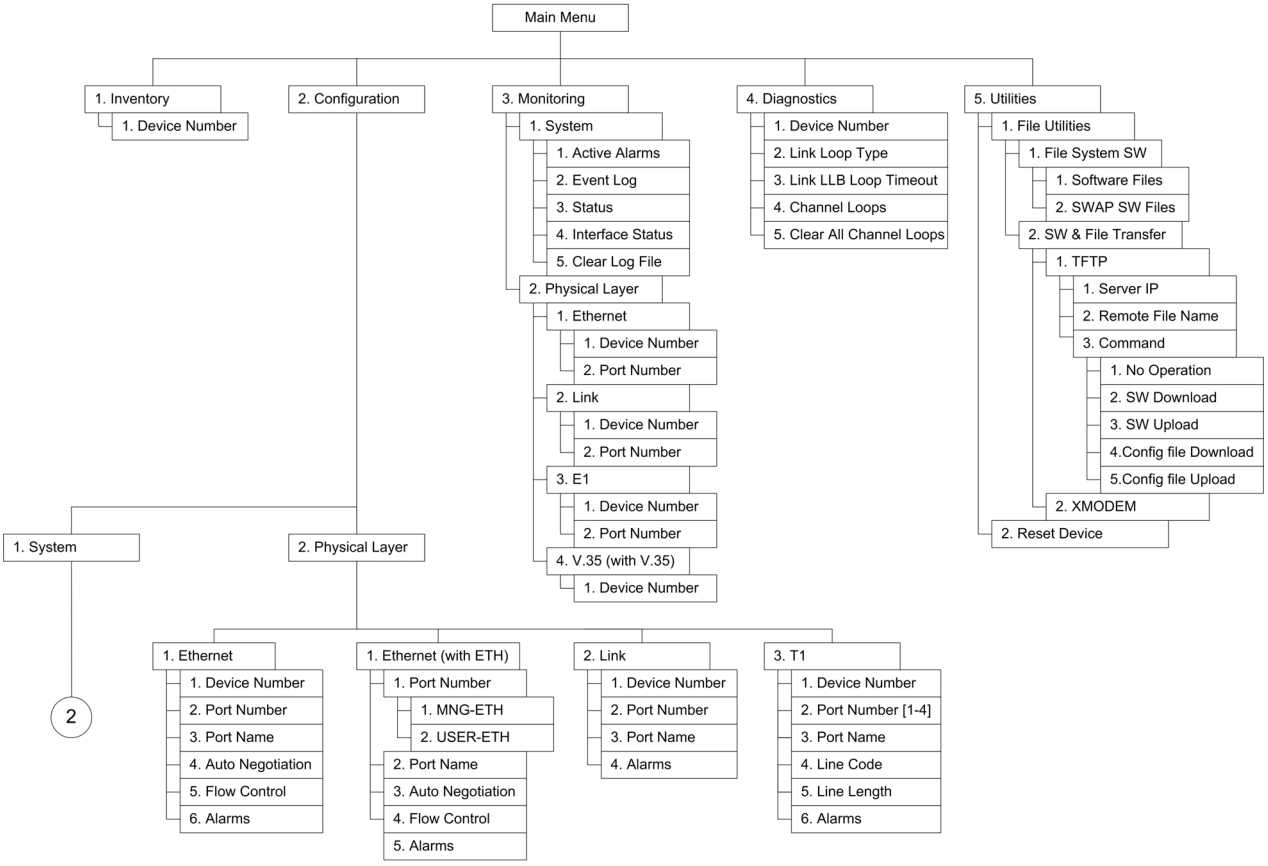


Figure 3-7. Main Menu Tree

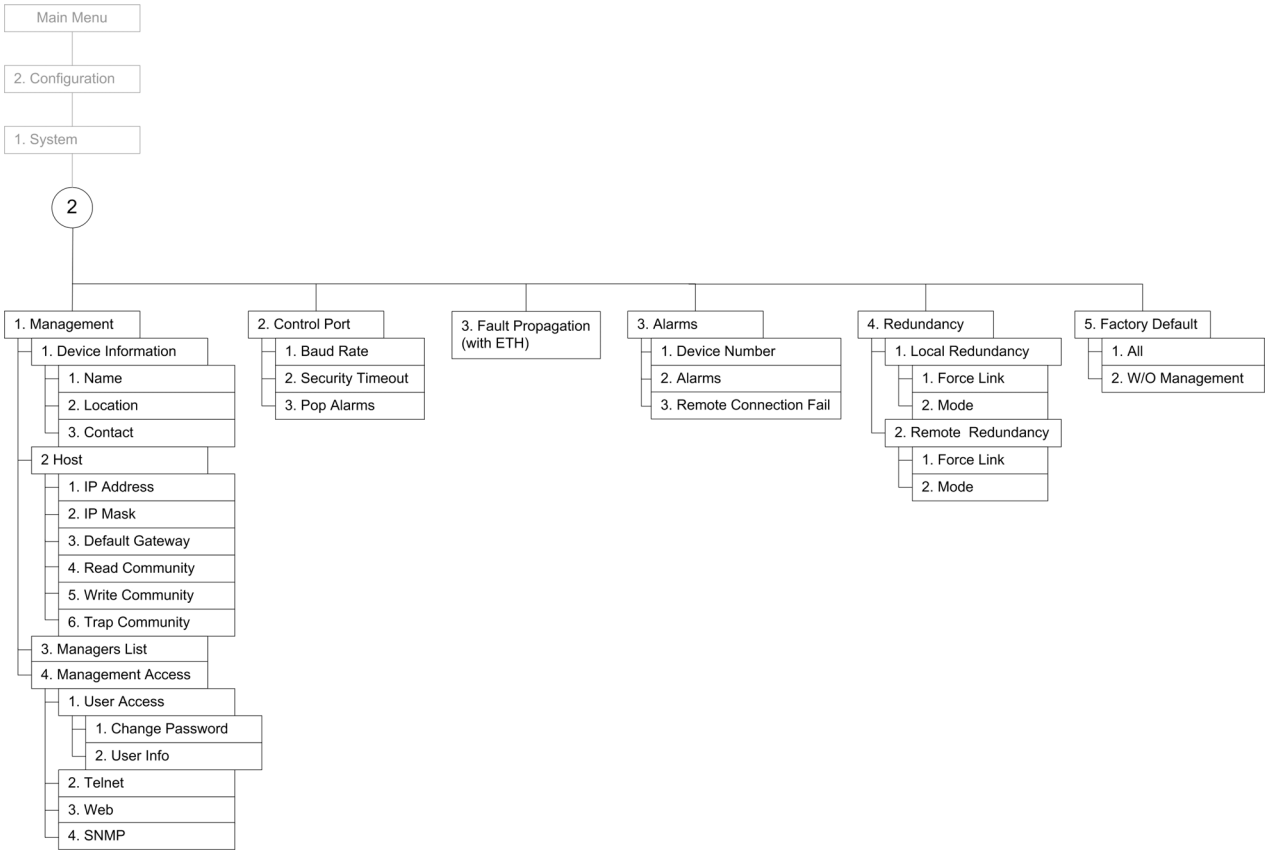


Figure 3-8. Main Menu Tree (cont.)

3.6 Turning Off Optimux-106

➤ To turn off Optimux-106:

- Disconnect the power cable(s) from the electricity outlet.

Chapter 4
Configuration

4.1 Configuring Optimux-106 for Management

A terminal allows you to:

- Set management parameters
- Set user name and password
- Mask channel and uplink alarms
- Set the redundancy mode of the uplink interface and the active link
- Reset Optimux-106 to the default configuration (removing loops and switching to the normal redundancy mode).

Setting the Device Information

Each Optimux-106 unit can be configured to hold information about the unit, such as its location and a name to easily identify the unit on the network.

➤ To set Device Information:

1. From Main menu, select Configuration›System›Management›Device Information.

```
                          Optimux-106
Configuration>System>Management>Device Information

   Description  ... (OP-106 HW Version:0.01/A, SW Version:6.10)
1. Name         ... (Optimux-106)
2. Location     ... (The location of this device)
3. Contact      ... (Name of contact person)

>
Please select item <1 to 3>
ESC-Previous menu; !-Main Menu; &-Exit                 1 User(s)
```

Figure 4-1. Device Information Screen

2. From the Device Information screen, set Optimux-106 parameters.

Table 4-1. Device Information

Parameter	Description
Description	Identifies the device, with current hardware and software version numbers

Parameter	Description
Name	The name of device. It is easier to identify the device by a name than by its IP address.
Location	The location of Optimux-106 unit
Contact	The name, phone, and/or any other details you want to save in this field.

Setting the Network Parameters

When you integrate Optimux-106 into your network, you need to set the network parameters of Optimux-106.

➤ To set network parameters:

1. From Main menu, select System›Management›Host.

```
                          Optimux-106
Configuration>System>Management>Host IP

1. IP Address               ...    (0.0.0.0)
2. IP Mask                  ...    (0.0.0.0)
3. Default Gateway          ...    (0.0.0.0)
4. Read Community           ...    (public)
5. Write Community          ...    ()
6. Trap Community           ...    ()

>
Please select item <1 to 6>
ESC-Previous menu; !-Main Menu; &-Exit                    1 User(s)
```

Figure 4-2. Host IP Menu

2. From the Host IP menu, set network parameters.

Table 4-2. Host Parameters

Parameter	Description
IP Address	The IP address of Optimux-106.
IP Mask	The IP mask.
Default Gateway	The IP address of the gateway.
Read Community	The read community. This field is used by SNMP. Specify a string of 15 characters.
Write Community	The write community. This field is used by SNMP. Specify a string of 15 characters.
Trap Community	The trap community. This field is used by SNMP. Specify a string of 15 characters.

Setting up the Manager List

By default, any remote management terminal is allowed to change the configuration of the Optimux-106. You may enhance the security of the site by limiting remote management to specific management terminals or nodes. The Manager List lists the network nodes from which management may take place.

```
                          Optimux-106
Configuration>System>Management>Managers List

Num    IP Address                          Trap
1      (0.0.0.0)                           Unmasked
2      (0.0.0.0)                           Unmasked
3      (0.0.0.0)                           Unmasked
4      (0.0.0.0)                           Unmasked
5      (0.0.0.0)                           Unmasked
6      (0.0.0.0)                           Unmasked
7      (0.0.0.0)                           Unmasked
8      (0.0.0.0)                           Unmasked
9      (0.0.0.0)                           Unmasked
10     (0.0.0.0)                           Unmasked

1. Change Cell                ... (0.0.0.0)

>
ESC-Previous menu; !-Main Menu; &-Exit; ?-Help
```

Figure 4-3. Managers List Screen

➤ To define the managers list:

1. The list contains 10 entries. Press **D** to move down the list; press **U** to move up the list. Press **L** to select the previous field; press **R** to select the next field.
2. To change the value of a field, select the field (it will appear highlighted), then choose **Change Cell** and then enter the new value. When the Trap field is set to **Unmasked**, a trap is sent to this agent.

Setting the Management Access

Management of the unit can be done via several types of access. Each access type can be available to all users, only users defined in the manager list, or blocked.

```
                          Optimux-106
Configuration>System>Management>Management Access

1. User Access                      >
2. Telnet                           >      (All)
3. WEB                              >      (All)
4. SNMP                             >      (All)

>
Please select item <1 to 4>
ESC-Previous menu; !-Main Menu; &-Exit
```

Figure 4-4. Manager Access Screen

Table 4-3. Manager Access Parameters

Parameter	Possible Value (default value in bold)	Description
Telnet	**All** Managers only None	The management terminal connects to Optimux-106 via Telnet connection.
WEB	**All** Managers only None	The management terminal connects to Optimux-106 via Web connection.
SNMP	**All** Managers only None	The management terminal connects to Optimux-106 via SNMP connection.

Changing a Password

To enhance security, you can specify a user name and password to control access to the Optimux-106 management functions.

Note *Each line at the "Change Password screen" (see* Figure 4-5 *) appears only after the previous change. All the instructions appear at the bottom of the screen.*

The access to the changing password screen is according to *Figure 4-5*:

```
                          Optimux-106
Configuration>System>Management>Management Access>User Access

1. Change password                          >
2. User info                                []

>
Please select item <1 or 2>
ESC-Previous menu; !-Main Menu; &-Exit
```

Figure 4-5. Access to the Change Password Screen

➤ To change the password:

1. From the User Access screen, choose ‹**1**› and enter the existing User Name (SU for example) and then press ‹**Enter**›.
2. Enter the existing password.
3. Choose **New Password** and then enter the new password. The new password may contain up to eight characters.
4. Choose **Confirm New Password** and then enter the password entered in the previous step.

   A confirmation message appears confirming the password change.

```
                              Optimux-106
. . . >Change Password

1. User Name                    ...    (SU)
2. Password                     ...    (****)
3. New Password                 ...    (****)
4. Confirm New Password         ...    _-

Please confirm new password (Up to 8 characters)
------------------------------------------------------------

PLEASE CONFIRM PASSWORD!
```

Figure 4-6. Change Password Screen

Listing Users

The following screen lists information about all users defined in the device.

```
                              Optimux-106
System>Management>Management Access>User Access>User Info

     User Name    Access level    Dynamic/Permanent
1    USER         RO              Permanent
2    SU           RW              Permanent

>
ESC-Previous menu; !-Main Menu; &-Exit; ?-Help
```

Figure 4-7. User Information Screen

Table 4-4. User Information Fields

Field	Possible Values	Description
User Name		Name of user defined in the device.
Access level	RO	Read Only. This user can display information, but cannot modify parameters.
	RW	Read/Write. This user has full control over the device and can modify parameters.
Dynamic/Permanent	Permanent Dynamic	Indicatese whether this user name is built into the system or added by an administrator. Built-in users are permanent.

Configuring the Control Port

The control port is used to connect a console terminal to the Optimux-106 device.

```
Configuration>System>Control Port

1. Baud rate                >    (115200 bps)
2. Security Timeout         >    (10 min.)
3. Pop Alarms               >    (On)

>
Please select item <1 to 3>
ESC-Previous menu; !-Main Menu; &-Exit
```

Figure 4-8. Control Port Menu

Table 4-5. Control Port Parameters

Parameter	Possible Value (**default value in bold**)	Description
Baud rate	9600 bps 19200 bps 38400 bps 57600 bps **115200 bps**	The baud rate that matches your management terminal device.
Security Timeout	Integer representing number of minutes **Default: 10 min.**	A timeout value in minutes. This value is the number of minutes of management inactivity after which Optimux-106 automatically disconnects from the management session. To reconnect, press **<Enter>** on the management terminal and then log in again.
Pop Alarms	On **Off**	When POP Alarms is **On**, new alarms appear at the bottom of the terminal screen. Regardless of the POP Alarms setting, the alarms are written to the log file.

4.2 Configuring Optimux-106 for Operation

Configuring Ethernet Port Parameters

Configuring the MNG-ETH port

The MNG-ETH port opion is for the management and user Ethernet configuration of Optimux-106.

➤ **To configure MNG-ETH port:**

1. From the configuration menu select **Physical Layer**.

   The Physical Layer screen is displayed.

```
                              Optimux-106
Configuration>Physical Layer

 1. Ethernet                          >
 2. Link                              >
 3. T1                                >

>
Please select item <1 to 3>
ESC-prev. menu; !-main menu; &-exit                          1 user(s)
```

Figure 4-9. Physical Layer Menu

2. From the Physical Layer menu select **Ethernet**.

   The Ethernet menu is displayed.

The Ethernet menu may display the configuration for either ETH-MNG or ETH-USER depending on the Port Number selected. To toggle between configurations, select **Port Number** and the Port Number Menu appears (*Figure 4-11*).

```
                              Optimux-106
Main Menu>Configuration>Physical Layer>Ethernet

1. Device number          >     (Local)
2. Port number            >     (MNG-ETH)
3. Port name                   …()
4. Auto Negotiation       >     (Enabled)
5. Flow Control           >     (Enabled)
6. Alarms                 >     (Unmasked)

>
Please select item <1 to 6>
ESC-Previous menu; !-Main Menu; &-Exit                     1 User(s)
```

Figure 4-10. Ethernet Menu

Table 4-6. Ethernet Management Parameters

Parameter	Possible Value (default value in bold)	Description
Device Number	**Local** Remote	Identifies the device Location
Port number	**MNG-ETH** USER-ETH	Opens menu for the MNG-ETH port Opens menu for the USER-ETH port
Port name	String up to 15 characters	A name easily Identifies the Ethernet port
Auto Negotiation	**Enabled** Disabled	Enables auto-negotiation.
Flow Control	**Enabled** Disabled	Enables flow control.

Parameter	Possible Value (default value in bold)	Description
Alarms	Masked **Unmasked**	Identifies whether alarms triggered by this Ethernet port are masked or not. When masked, these alarms are not trapped and are not recorded in the log file.

3. Select **Port Number** to set the Fast Ethernet port number to **MNG-ETH** or **USER-ETH**.
4. Select **Port Name** to set a name to the port (USER-ETH only).
5. Select **Autonegotiation** and toggle between the **Enabled** and **Disabled** options.
6. Select **Flow Control** to toggle between the **Enabled** and **Disabled** options.
7. Select **Alarms** to mask or unmask the Fast Ethernet alarms.

Configuring the Ethernet User Port

➤ **To configure the Ethernet User port:**

1. From the Ethernet menu (*Figure 4-10*), select **Port Number**.

   The Port Number menu opens.

```
Configuration>Physical Layer>Ethernet>Port Number

 1. ETH-MNG
 2. ETH-USER

>
Please select item <1 to 2>
ESC-prev. menu; !-main menu; &-Exit                    1 User(s)
```

Figure 4-11. Port Number Menu

2. From the Port Number Menu (see *Figure 4-11*) choose **ETH-USER**.

   The Ethernet User menu appears.

```
                          Optimux-106
Main Menu>Configuration>Physical Layer>Ethernet

 1. Device number       >   (Local)
 2. Port number         >   (USER-ETH)
 3. Administrative status   (UP)
 4. Port name              …()
 5. Auto Negotiation        (Enabled)
 6. Flow Control          > (Enabled)
 7. Alarms                > (Unmasked)

Please select item <1 to 7>
ESC-Previous menu; !-Main Menu; &-Exit                 1 User(s)
```

Figure 4-12. Ethernet USER Menu

Table 4-9 describes the fields in the Ethernet management menu.

Table 4-7. Ethernet USER Parameters

Parameter	Possible Value	Description
Device Number	**Local** Remote	Identifies the device Location
Port number	MNG-ETH **USER-ETH**	Opens menu for the MNG-ETH port Opens menu for the USER-ETH port
Port name	String up to 15 characters	A name easily Identifies the Ethernet port
Administrative Status	**UP** Down	Port status is up. Port status is down.
Autonegotiation	**Enabled** Disabled	Enables autonegotiation.
Flow Control	**Enabled** Disabled	Enables flow control.
Alarms	Masked **Unmasked**	Identifies whether alarms triggered by this Ethernet port are masked or not. When masked, these alarms are not trapped and are not recorded in the log file.

3. Select **Administrative Status** and set the status to either **Up** or **Down**.
4. Select **Port Name** to set a name to the port (ETH-USER only).
5. Select **Autonegotiation** and toggle between the **Enabled** or **Disabled** options.
6. Select **Flow Control** to toggle between the **Enabled** or **Disabled** options.
7. Select **Alarms** to mask or unmask the USER Ethernet alarms.

Configuring Fault Propagation

Optimux-106 has an option of Alarm Forwarding (Fault propagation) of the USER-ETH port. The user can enable or disable this option.

The control port is used to connect a console terminal to Optimux-106.

```
Configuration>System

1. Management                    >
2. Control Port                  >
3. Fault Propagation                 (Off)
4. Alarms                        >
5. Redundancy                    >
6. Factory Default               >

Please select item <1 to 3>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 4-13. Control Port Menu

Table 4-8. Ethernet USER Fault Propagation

Parameter	Possible Value (default value in bold)	Description
Fault Propagation	On	Activate Fault Propagation functionality: • When signal loss or sync loss is detected on the uplink, the USER Ethernet port on both (local and remote products) is shut down. • When the USER Ethernet port detects that the link is down, it automaticaly shuts down the USER ethernet port on the remote product.
	Off	Deactivate the Fault propagation functionality

Configuring T1 Channel Parameters

The following menu is used to configure the T1 ports.

```
                          Optimux-106
Main Menu>Configuration>Physical Layer>T1

1. Device Number        >       (Local)
2. Port number          >       (1)
3. Port Name            ...     ()
4. Line Code            >       (B8ZS)
5. Line Length (ft)     >       (0-133)
6. Alarms               >       (Unmasked)

>
Please select item <1 to 6>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 4-14. T1 Configuration Screen

Table 4-9. T1 Channel Parameters

Parameter	Possible Value	Description
Device Number	**Local** Remote	Identifies whether parameters shown are for the local or remote device.
Port number	**1** to 4	Identifies the T1 port to configure.
Port Name	String of up to 15 characters **Default:**	A name to easily identify this T1 port.
Line code	**B8ZS** AMI	Identifies the T1 Line coding

Parameter	Possible Value	Description
Line Length (ft)	**1. 0-133** 2. 134-266 3. 267-399 4. 400-533 5. 534-655	Identifies the T1 Channel line length
Alarms	Masked **Unmasked**	Identifies whether alarms triggered by this port are masked or not. When masked, these alarms are not trapped and are not recorded in the log file.

Configuring Uplink Parameters

The following menu is used to configure the uplinks.

```
                          Optimux-106
Main Menu>Configuration>Physical Layer>Link

1. Device Number        >       (Local)
2. Port number          >       (LINK A)
3. Port Name            ...     ()
4. Alarms               >       (Unmasked)

>
Please select item <1 to 4>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 4-15. Link Menu

Table 4-10. Uplink Parameters

Parameter	Possible Value	Description
Device Number	**Local** Remote	Identifies whether parameters shown are for the local or remote device.
Port number	**LINK A** or LINK B	Identifies the uplink port to configure.
Port Name	String of up to 15 characters **Default**	A name to easily identify this uplink port.
Alarms	Masked **Unmasked**	Identifies whether alarms triggered by this port are masked or not. When masked, these alarms are not trapped and are not recorded in the log file.

Configuring Redundancy

Configuring Local Redundancy

```
                              Optimux-106
Configuration>System>Redundancy>Local Redundancy

1. Force Link              (LINK A)
2. Mode             >      (Auto)

>
Please select item <1 to 2>
ESC-Previous menu; !-Main Menu; &-Exit
```

Figure 4-16. Local Redundancy Menu

Table 4-11. Local Redundancy Parameters

Parameter	Possible Values	Description
Force Link	Link A Link B	Sets the active link.
Mode	Auto	When the selected Main Link (for example, Link A) fails, Optimux-106 automatically switches over to the backup Main Link (Link B, in this example). When Link A recovers, the active link returns to Link A.
	Manual	When the selected Force Link fails, the system switches to the backup link. The backup link remains in use, even if the Force Link returns to service.
	Off	Turns off redundancy. When the selected Main Link fails, Optimux-106 does not change over to the backup Main Link.

Note *You can set the mode for the remote device, which will then perform redundancy according to the status of its links.*

Configuring Remote Redundancy

```
                              Optimux-106
Configuration>System>Redundancy>Remote Redundancy

1. Force Link       >      (LINK A)
2. Mode             >      (Auto)

>
Please select item <1 to 2>
ESC-Previous menu; !-Main Menu; &-Exit
```

Figure 4-17. Remote Redundancy Menu

The parameters for configuring remote redundancy are the same as those for configuring local redundancy. For more information, see *Table 4-11*.

4.3 Performing Additional Tasks

Viewing File System Information

Information about the file system is accessed via the following screen.

```
                          Optimux-106
Utilities>File Utilities>File System

1. SW Files              []
2. SWAP SW Files

>
Please select item <1 to 2>
ESC-Previous menu; !-Main Menu; &-Exit                1 User(s)
```

Figure 4-18. File System Menu

➤ To view information about the file system:

- Choose **SW Files**.

  The SW Files screen is displayed, showing information about the active and backup software partitions as well as the boot version.

```
Utilities>File Utilities>File System>SW Files

 Software active version                6.10
 Software active partition                 0
 Code size                            451933
 Date <dd-mm-yy>                      03-09-07
 Software backup version              0.00n00
 Software backup partition                 1
 Code size                                 0
 Date <dd-mm-yy>                      00-00-00
 Boot version                           1.02
 Boot mng version                      10.03

ESC-Previous menu; !-Main Menu; &-Exit                1 User(s)
```

Figure 4-19. SW Files Screen

Swapping the Software Files

When the software file is downloaded to the backup partition, it can be swapped with the main software file.

➤ To swap between software versions:

1. To swap the active and backup software partitions, choose **SWAP SW Files** (see *Figure 4-18*).

   The Optimux-106 reboots from the other partition.

2. After the system has come up, display the SW Files screen to verify that the change took place.

Viewing the Inventory

The Inventory Screen lists all the various components installed in Optimux-106. Where relevant, version names of hardware and software are also displayed.

```
Inventory

1. Device Number          >    (Local)
   Device type            >    (Optimux-106)
   Boot version           ...  (1.12 mng 10.03)
   SW version             ...  (6.10)
   HW version             ...  (0.01 Firmware: 4BE Ver. 1.00)
       INTERFACES INFORMATION
   Uplink A               ...  (SF3   )
   Uplink B               ...  (SF3   )
   T1 Channel 1-4         ...  (RJ-45, Balanced(100 ohm))
   ETH-MNG                ...  (RJ-45, 10/100BaseT)
   ETH-USER               ...  (RJ-45, 10/100BaseT)
   Control Port           ...  (Mini USB 5, RS-232)
   PS A type              >  (AC/DC)
   PS B type              >  (AC/DC)

Please select item <1 to 1>
ESC-prev. menu; !-main menu; &-exit                  1 user(s)
```

Figure 4-20. Inventory Screen

Resetting to Factory Defaults

You can reset all of the local Optimux-106 configuration parameters to their default settings, or you can reset all parameters except for the management settings (IP addresses).

```
Configuration>System>Factory Default

1. All                 >
2. W/O Management      >

>
Please select item <1 to 2>
ESC-Previous menu; !-Main Menu; &-Exit              1 user(s)
```

Figure 4-21. Factory Default Menu

➤ To reset parameters to the factory defaults:

1. To reset all parameters to the factory default, choose **All**.

Note *In the TELNET and WEB screens, the option All is not displayed.*

   To reset all parameters except for the management information to the factory default, choose **W/O Management**.

   A confirmation message is displayed.

2. Enter **Y** (Yes) to confirm the reset operation.

Resetting Optimux-106

➤ **To reset Optimux-106:**

1. From the Main Menu, choose **Utilities** > **Reset**.

   A confirmation message is displayed.

2. Enter **Y** (Yes) to reset the device.

Terminal Management Modes

The use of a terminal is optional for configuration, monitoring, and maintenance operations.

The Optimux-106 provides the following terminal management modes:

- **Monitor** – A supervisory ASCII ANSI terminal or a PC emulating an ASCII ANSI terminal connected directly to the Optimux-106 CONTROL port.
- **Ethernet** – A PC running terminal emulation software or a management workstation, connected to the Optimux-106 via an Ethernet cable. It must be possible to activate Telnet and Web access after setting the IP address.

Up to three users can be active simultaneously, one connected to the terminal and two via Telnet or Web. When connected via Telnet or Web, the user is disconnected after 10 minutes of inactivity (no keyboard input on the client computer).

Optimux-106 supports several management information bases (MIBs). Refer to *Appendix B* for details.

Chapter 5

Monitoring and Diagnostics

5.1 Monitoring Performance

You can monitor the following aspects of the Optimux-106 system:

- System up-time
- MAC Address
- Alarms and events
- Interface status
- Local system status
- Remote system status.

```
                          Optimux-106
Monitoring>System

    MAC Address                ...    (00-20-D2-22-E1-5F)
    Sys Up Time                ...    (05:06:34)
1. Active Alarms               [1]  >
2. Event Log                   [5]  >
3. Status                          >
4. Interface Status            []   >
5. Clear Log File

>
Please select item <1 to 5>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 5-1. Monitoring Menu

Table 5-1. System Monitoring Parameters

Parameter	Description
MAC Address	The address the device holds when transmitting frames via the Ethernet port.
Sys Up Time	Elapsed time since system was powered up.
Active Alarms	Displays the number of active alarms. To view the alarms, enter **1**.

Parameter	Description
Event Log	Displays the number of events logged by the system. To view the events, enter **2**.
Status	Enter **3** to display the detailed system status.
Interface Status	Displays the current interface status. To view the detailed interface status, enter **4**.
Clear Log File	To clear the log file, enter **5**

Monitoring the Status of the System

The System Status screen displays the current status of the local or remote Optimux-106 unit.

```
                          Optimux-106
Monitoring>System>Status

1. Device Number                >   (Local)
    Device Type                 >   (Optimux-106)
    Force Link                  >   (LINK A)
    Active Link                 >   (LINK A)
    Redundancy mode             >   (AUTO)
    Redundancy Status           >   (Available)
    PS A status                 >   (OK)
    PS B status                 >   (OK)
    Alarm Indication            >   (Major)
    Test Indication             >   (Off)

>
Please select item <1 to 1>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 5-2. System Status Screen

Table 5-2. System Status Parameters

Parameter	Description
Device Number	Indicates the Optimux-106 currently being monitored: • Local • Remote
Device type	Displays the device type
Redundancy status	Indicates if redundancy is available or not available • Available – two uplinks are mounted • Not Available – only one uplink is mounted or Redundancy mode is 'OFF'

Redundancy mode	The redundancy state of the system: • AUTO • MANUAL • OFF The option is hidden when redundancy status is not available.
Force Link	Indicates the main uplink
Active Link	Identifies the currently active link
PS A Status	The state of the Power Supply A: • OK • Fault
PS B Status	The state of the Power Supply B: • OK • Fault
Alarm Indication	Current system status: • Normal - System is functioning normally; no alarms activated • Major - One or more major alarms are currently activated • Minor - One or more minor alarms are currently activated
Test Indication	Indicates whether any tests are currently active in the device: • ON - Tests are currently active in the device • OFF - No tests are currently running

➤ To set the device to monitor:

- Enter **1**.

  The Device Number toggles between **Local** and **Remote**, to indicate the device currently being monitored.

Monitoring the Interface Status of the System

The Interface Status Screen displays the current status of the local and remote interfaces.

```
                              Optimux-106
Monitoring>System>Interface Status

    Description    Type              Operation    Speed
1   Loc uplink A   Proprietary       Up           101904000
2   Loc uplink B   Proprietary       Down         101904000
3   Loc Ch 1       T1                Up           1544000
4   Loc Ch 2       T1                Up           1544000
5   Loc Ch 3       T1                Up           1544000
6   Loc Ch 4       T1                Up           1544000
7   Loc MNG-ETH    ETH               Up           100000000
8   Loc USER-ETH   ETH               UP           100000000

>
ESC-Previous menu; !-Main Menu; &-Exit; ?-Help        1User(s)
```

Figure 5-3. Remote System Status Screen

Monitoring the Physical Ports

You can monitor the following aspects of the physical ports on the Optimux-106:

- Management port status
- Uplink status
- Channel status.

Monitoring the Status of the Ethernet Port

The Ethernet Status Screen displays the current status of the local or remote Ethernet port.

To display the status of the Ethernet port:

1. From the Monitoring menu, select **Physical Layer› Ethernet**.

   The Ethernet screen is displayed.

```
                          Optimux-106
Monitoring>Physical Layer>Ethernet

1. Port number                >    (MNG-ETH)
    Operation                 >    (Up)
    Auto negotiation Status   >    (Completed)
    Speed & Duplex            >    (100Mbps Full Duplex)
    Alarm                     >    (Unmasked)

>
Please select item <1 to 1>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 5-4. MNG-ETH Status Screen

Table 5-3. MNG-ETH Status Parameters

Parameter	Possible Values	Description
Operation	**Up** Down	Indicates the current operational status of the device.
Autonegotiation Status	**Completed**	Indicates the current status of autonegotiation.
Speed & Duplex	100Mbps Full Duplex 100Mbps Half Duplex 10Mbps Full Duplex **10Mbps Half Duplex**	Indicates the speed and duplexity configured for the Ethernet port.
Alarm	Masked **Unmasked**	Identifies whether alarms on the device are masked or not. When masked, Ethernet alarms are not trapped.

2. To see the ETH-USER status, select **2**.

3. Select ETH-USER port (2).

   The USER-ETH screen is displayed.

```
Monitoring>Physical Layer>Ethernet

1. Port number                 >    (USER-ETH)
    Administrative status      >    (Up)
    Operation                  >    (Up)
    Auto negotiation Status    >    (Completed)
    Speed & Duplex             >    (100Mbps Full Duplex)
    Alarm                      >    (Unmasked)

Please select item <1 to 1>
ESC-Previous menu; !-Main Menu; &-Exit
```

Figure 5-5. USER-ETH Status Screen

Table 5-4. USER-ETH Status Parameters

Parameter	Possible Values	Description
Administrative status	Port Status	Indicates the port status
Operation	**Up** Down	Indicates the current operational status of the device.
Autonegotiation Status	**Completed**	Indicates the current status of autonegotiation.
Speed & Duplex	100Mbps Full Duplex 100Mbps Half Duplex 10Mbps Full Duplex **10Mbps Half Duplex**	Indicates the speed and duplexity configured for the Ethernet port.
Alarm	Masked **Unmasked**	Identifies whether alarms on the device are masked or not. When masked, Ethernet alarms are not trapped.

Monitoring the Status of the Uplink

```
Monitoring>Physical Layer>Link

1. Device Number              >    (Local)
2. Port Number                >    (LINK A)
    Operation                 >    (Up)
    Alarm Indication          >    (Normal)
    Test Indication           >    (Off)
    Alarm                     >    (Unmasked)

>
Please select item <1 to 1>
ESC-Previous menu; !-Main Menu; &-Exit                    1 User(s)
```

Figure 5-6. Uplink Status Screen

Table 5-5. Uplink Status Parameters

Parameter	Possible Values	Description
Device Number	**Local** Remote	Identifies the device currently being monitored.
Port Number	**LINK A** or LINK B	Identifies the uplink currently being monitored.
Operation	**Up** Down	Indicates the current operational status of the device.
Alarm Indication	**Normal** Signal loss	Indicates the highest status level of current alarms.
Test Indication	On **Off**	Indicates whether a loopback test is currently being run.
Alarm	Masked **Unmasked**	Identifies whether alarms on the device are masked or not. When masked, Ethernet alarms are not trapped.

➤ **To monitor the status of the uplink:**

1. To toggle between the local and remote device, enter **1**.

   The Device Number changes to identify the unit currently being monitored.

2. To toggle between LINK A and LINK B, enter **2**.

   The screen displays the current status of the selected port on the selected device.

Monitoring the Status of the T1 Port

```
                          Optimux-106
Monitoring>Physical Layer>T1

1. Device Number             >    (Local)
2. Port Number [1..4]        >    (1)
   Operation                 >    (Down)
   Alarm Indication          >    (Signal loss)
   Test Indication           >    (Off)
   Alarm                     >    (Unmasked)

>
Please select item <1 to 2>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 5-7. T1 Port Status Screen

The T1 port parameters are the same as those in the Uplink Status Screen. For more information, see *Figure 5-6*.

➤ To monitor the status of the T1 port:

1. To toggle between the local and remote device, enter **1**.

   The Device Number changes to identify the unit currently being monitored (**Local** or **Remote**).

2. To select a T1 port to monitor, enter **2** and then the port number (1 to 4).

   The screen displays the current status of the selected port on the selected device.

5.2 Detecting Errors

The status of Optimux-106 is indicated by the Link A and B, CH1 to CH4 and Power supply LEDs indicators located on the front panel. For the description of LEDs and their functions, refer to *Chapter 3*.

5.3 Handling Alarms

Optimux-106 detects fault conditions and initiates alarms and events to alert the user:

- **Alarms** (major and minor) have two statuses: ON and OFF. The alarm status automatically changes to OFF when a fault condition that triggered the alarm is cleared.
- **Events** have only ON status.

Displaying System Alarms

```
Monitoring>System>Active Alarms

   Source      Description                 Severity    Status
1  Local Dev   Remote Connection Failed    Major       Unmasked
2  Local Dev   Redundancy not available    Major       Unmasked

>
ESC-Previous menu; !-Main Menu; &-Exit; ?-Help          1 User(s)
```

Figure 5-8. Active Alarms Screen

Table 5-6. Active Alarm Screen Fields

Field	Description
Source	The source that generated the alarm. Can be one of the following: **Local Device** – system level alarm **Local LINK <A,B>** – alarm generated on local uplink **Remote LINK <number>** – alarm generated on remote uplink **Local T1 <number>** – alarm generated on local T1 port **Remote T1 <number>** – alarm generated on remote T1 port **Local Ethernet Management** – alarm generated on local Ethernet port **Remote Ethernet Management** – alarm generated on remote Ethernet port
Description	Description of the alarm
Severity	Indicated the severity of the relevant alarm MINOR- Minor alarm MAJOR- Major alarm
Status	Status of the alarm: Masked – active alarm for which no trap is sent. Unmasked – active alarm for which trap is sent.

The Optimux-106 system alarms are described in *Table 5-8*.

Configuring Alarms

You can configure whether various groups of alarms are trapped or not.

```
Configuration>System>Alarms

1. Device Number              >    (Local)
2. Alarms                     >    (Unmasked)
3. Remote Connection Failed   >    (Unmasked)

>
Please select item <1 to 3>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 5-9. Alarm Menu

Table 5-7. Alarm Configuration Parameters

Parameter	Possible Values	Description
Device Number	**Local** Remote	Sets whether local or remote device is to be masked or unmasked
Alarms	Masked **Unmasked**	Masked – The selected device alarms are masked Unmasked – The selected device alarms are unmasked
Remote Connection Failed	Masked **Unmasked**	Masked – The selected remote connection alarm are masked Unmasked – The selected remote connection alarm are unmasked

List of Alarms and Events

The Optimux-106 alarms are described in *Table 5-8*.

Table 5-8. Optimux-106 System Alarms

Code	Message on terminal	Description		Severity
1	PS A fail	No voltage in power supply A.		Major
2	PS B fail	No voltage in power supply B.		Major
3	Remote connection FAIL	A managment connection could not be established with the remote device.		Major
4	Redundancy not available	Redundancy mode is set to AUTO or MANUAL but the second link is not installed.		Major
30	ETH Integrity fail	Failure in Ethernet management port integrity or in the fast Ethernet integrity.	ETH-MNG ETH	Major
31	Signal Loss	Signal loss detected on uplinks or channels.	T1 Link	Major
33	Rx AIS	Received AIS on the uplinks or the channels.	T1	Minor

The Optimux-106 events are described in *Table 5-9*.

Table 5-9. Optimux-106 Events

Code	Event	Description
100	Software process failed	Failed to process software download.
101	Buffer overflow	The event log buffer exceeded its maximum size and new events are written over the old ones.

5.4 Troubleshooting

If a problem occurs, check the displayed indications and refer to *Section 3-2* and *Table 3-1* for their interpretation.

Identify the trouble symptoms and perform the actions listed under Corrective Measures in the order given in *Table 5-10*, until the problem is corrected.

Table 5-10 Troubleshooting Chart

Trouble Symptoms	Probable Cause	Corrective Measures
Optimux-106 does not respond	No power	Check that both ends of the power cable are properly connected. If the power cable is properly connected, but the power supply still does not respond, then the power supply is defective (see below). If Optimux-106 is powered from a DC source, check the polarity of the power connections.
	Defective Power Supply	Disconnect the power from both ends and replace with another power supply.
	Defective Optimux-106	Replace the Optimux-106 unit.
PWR indicator lights in red or yellow	Defective power supply	Turn the respective power supply off for at least 10 minutes, and then turn it on again. If the PWR indicator is still red or yellow, have Optimux-106 repaired as soon as possible.
The SYNC LOSS indicator of the Uplink lights.	External problem	Activate the local loopback on Optimux-106. Check that the SYNC LOSS and AIS indicators of the Uplink in use turn OFF. If the indicators turn off, check the T3 interface connections, the T3 transmission path to the remote unit, and the remote unit.
	Defective Optimux-106	Replace the Optimux-106 unit.
	Defective Optimux-106	Activate the local loopback on Optimux-106. Check that the SYNC LOSS and AIS indicators of the Uplink in use turn OFF. If one of the indicators remains lit, replace Optimux-106.
None of the units connected to a local Optimux-106 receive the remote equipment.	External problem	Activate the local loopback on Optimux-106. Check that all the SYNC LOSS and AIS indicators turn OFF, and that the equipment connected to the local tributaries receives their own transmissions. If the indicators turn OFF, the problem is external. Troubleshoot the remote unit, and the uplink transmission path.
	Defective Optimux-106	Replace the Optimux-106.

Trouble Symptoms	Probable Cause	Corrective Measures
Only one of the units connected to a local Optimux-106 does not receive the remote equipment.	Equipment problem	Check the equipment connected to the local tributary, and its cable connections. Check the remote tributary equipment.
	Defective Optimux-106	Activate the uplink local loopback in the local Optimux-106. Check that any previously lit alarm indicators related to the tributary turns OFF. If the indicator turns OFF, the problem is external; if the indicators remain lit, replace Optimux-106.
No menus are available.	Incomplete downloading of new FLASH version	Turn Optimux-106 ON and proceed to download the new FLASH version again.

5.5 Performing Diagnostic Tests

Optimux-106 supports the following types of loopback connections:

- Loopback at the local Optimux-106
- Loopback towards the remote Optimux-106.

The test functions are controlled by the management software. The available loopback functions are described in the following paragraphs.

Diagnostics

Setting Uplink Loopbacks

Diagnostic loopbacks are configured and monitored using the following menu:

```
                          Optimux-106
Diagnostics

1. Device Number                          >       (Local)
2. Link Loop type                           >     (No Loop)
3. Link LLB loop timeout (min) [1-255]    ...   (5)
4. Channel's Loop                               [] >
5. Clear all Channel's loops

>
Please select item <1 to 5>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 5-10. Diagnostics Menu

Table 5-11. Diagnostics Parameters

Parameter	Possible Value	Description
Device Number	**Local** Remote	Identifies whether parameters shown are for the local or remote device.
Link Loop type	**No Loop** LLB RLB	Identifies the type of loop set on the uplink port: • LLB – Loopback set on local device • RLB – Loopback set on remote device.
Link LLB loop timeout	1 to 255 (test runs for the specified number of minutes) **Default: 5**	The duration of the loopback test, in minutes. This value applies to both uplinks and T1 loopback tests. A value of 0 can only be set on the local device.
Channel's Loops		Displays the T1 Loop menu (see *Figure 5-11*).
Clear all Channel's loops		Clears all T1 loops

➤ **To run a loopback on an uplink:**

1. Set Device Number to the device being configured (Local or Remote).
2. Set the uplink LLB loop timeout to the number of minutes the loopback must run.
3. Set uplink Loop type to the type of loop to run on this device (LLB or RLB).

   The loopback test begins running immediately after the loopback is set.

Caution

Setting the Uplink Local Loopback (LLB) in the remote Optimux-106 disconnects the link, and as such, is irreversible. To remove this loopback, connect a terminal to the remote unit or shut down the power to the remote unit. If you set the Uplink LLB timeout on the remote Optimux-106, the loopback test will stop after the specified timeout period.

Setting T1 Channel Loopbacks

The device being configured is set in the Diagnostics Menu (*Figure 5-10*). The loopback on each port is set via the following screen.

```
                              Optimux-106
Diagnostics>T1 Loop

   Number      Loop                  Number      Loop
1. Channel-1   No Loop               Channel-2   No Loop
2. Channel-3   No Loop               Channel-4   No Loop

1. No Loop
2. LLB
3. RLB

>
Please select item <1 to 3>
ESC-Previous menu; !-Main Menu; &-Exit                    1 User(s)
```

Figure 5-11. T1 Loop Screen

➤ **To run a loopback on an T1 port:**

Do the following in the Diagnostics Menu (for more information, see *Setting Uplink Loopbacks*):

1. Set **Device Number** to the device being configured (Local or Remote).
2. Choose **T1 Loop**.

   The T1 Loop Screen (*Figure 5-11*) appears.
3. Using the Tab key, highlight the Loop field of the channel you want to set.
4. Enter the loopback status you want to set:
   - **No loop**: No loopback on the channel
   - **LLB**: Local loopback on the channel or uplink
   - **RLB**: Remote loopback on the channel.

   The RLB option appears only if there is a connection to a remote device.

   See *Chapter 5* for definitions of local T1 and uplink local loopbacks in the remote Optimux-106. The uplink local loopback applies to the active link only.

   The loopback test begins running immediately after a loopback has been set.

Local Loopbacks in Optimux-106

You can set two types of local loopback connections in Optimux-106:

- T1 local, which is set for each T1 interface separately from a terminal.
- Uplink local, which can be set from a terminal.

T1 Local Loopback in Optimux-106

The T1 local loopback returns the T1 transmit signal to the output of the receive path. Simultaneously, an unframed all-ones signal is sent to the MUX.

Figure 5-12 shows the T1 local loopback connection.

This test checks the operation of the connections to the equipment attached to the local tributary interfaces.

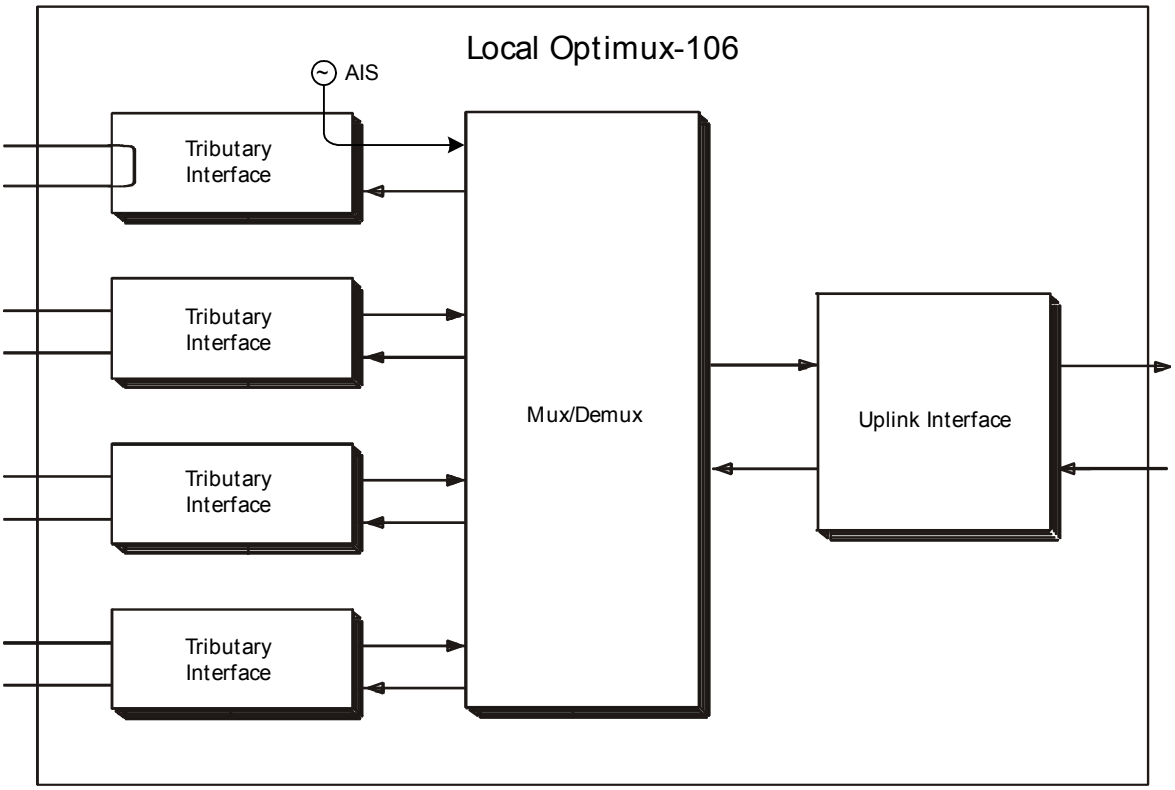


Figure 5-12 T1 Local Loopback in Optimux-106

Each port can be set separately.

Uplink Local Loopback in the Optimux-106

The Uplink local loopback returns the transmit signal of the active Uplink interface to the input of the receive path. Simultaneously, the local Optimux-106 sends an unframed all-ones signal to the uplink.

Figure 5-13 shows the Uplink local loopback connection.

When this loopback is activated, the equipment connected to the local Optimux-106 tributary must receive its own transmission.

This test checks the operation of the local Optimux-106, and the connections to the equipment attached to the tributary interfaces.

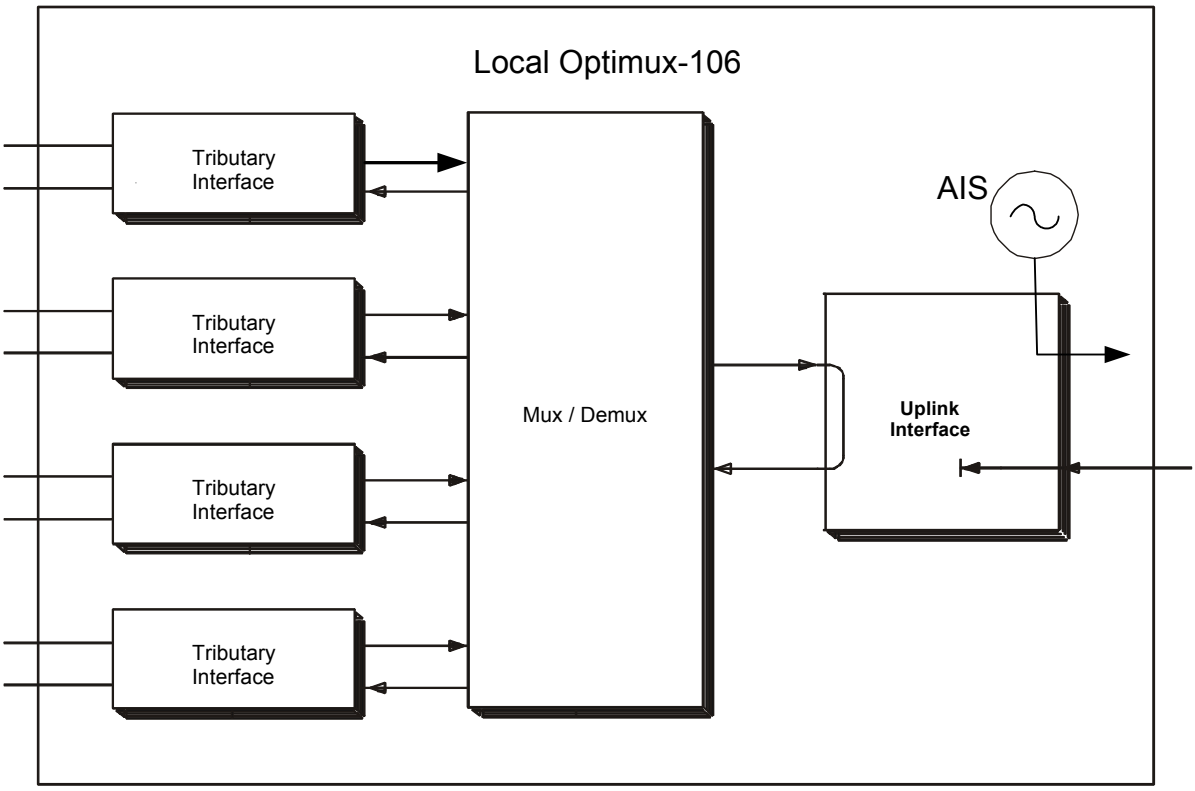


Figure 5-13 Uplink Local Loopback in the Optimux-106

Remote Loopbacks in Optimux-106

You can set two types of remote loopback connections in the Optimux-106 unit:

- T1 remote, which is set for each T1 interface separately, from the terminal
- Uplink remote, which can be set from the terminal.

T1 Remote Loopback in Optimux-106

The T1 remote loopback returns the transmitted demultiplexed T1 to the receiver multiplexer. Simultaneously, the Optimux-106 sends an unframed all-ones signal to the T1 link.

Figure 5-14 shows the T1 remote loopback connection.

This test checks the operation of the local Optimux-106 and the connection to the remote Optimux-106 unit.

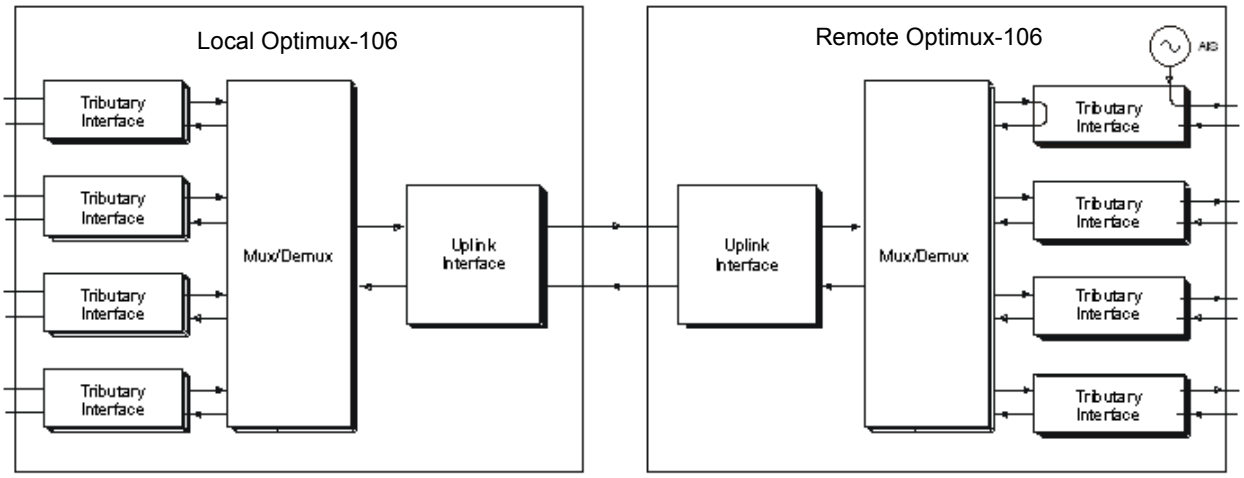


Figure 5-14 T1 Remote Loopback in Optimux-106

Uplink Remote Loopback in Optimux-106

The Uplink remote loopback returns the received signal of the active uplink interface to the input of the transmit path. Simultaneously, the remote Optimux-106 sends an unframed all-ones signal to the input of the Uplink Demux.

Figure 5-15 shows the Uplink remote loopback connection.

This test checks the operation of the local Optimux-106 and the connection to the remote Optimux-106.

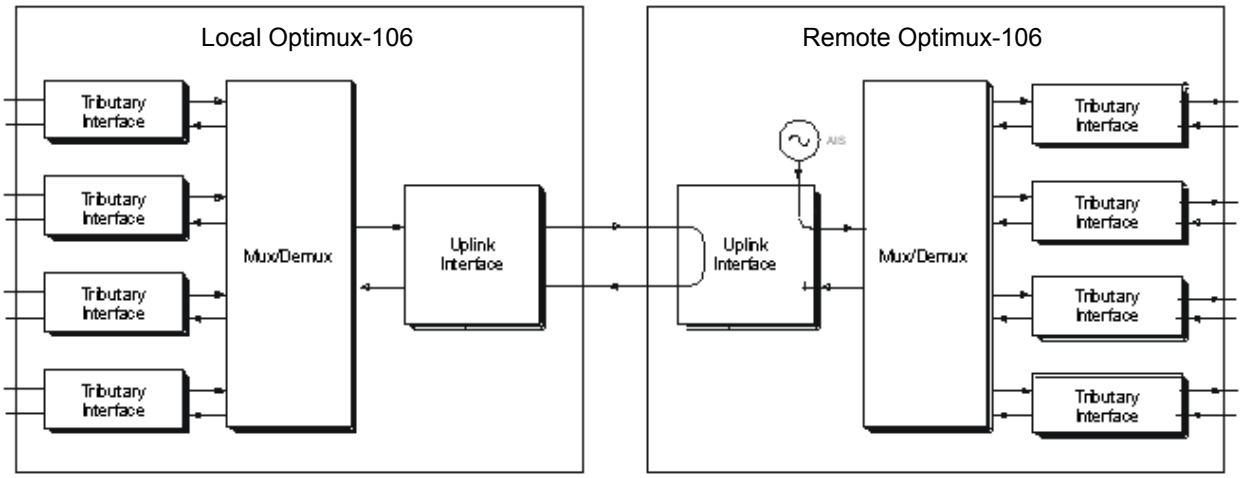


Figure 5-15 Uplink Remote Loopback in Optimux-106

Working with the System Log File

Displaying the System Log File

The Event log displays up to 200 events. When the event log buffer is full, each new event replaces the currently oldest event.

```
                                Optimux-106
Monitoring>System>Event Log

      Source            Alarm                          Status   Severity
   1  Local Device      Remote connection fail         ON       MAJOR
   2  Local MNG-ETH     ETH Integrity fail             ON       MAJOR
|  3  Local USER-ETH    ETH Integrity fail             ON       MAJOR
v  4  Local Device      Redundancy not available       ON       MAJOR
   5  Local Ch-1        Signal Loss                    ON       MAJOR
   6  Local Ch-2        Signal Loss                    ON       MAJOR
   7  Local Ch-3        Signal Loss                    ON       MAJOR
   8  Local Ch-4        Signal Loss                    ON       MAJOR
   9  Local Device      Cold Start                     NA       EVENT
  10  Local Device      Local login                    NA       EVENT
      ->>

>
ESC-prev.menu; !-main menu; &-exit; ?-help                          1 user(s)
```

Figure 5-16. Event Log Screen

Table 5-12. Event Log Screen Fields

Field	Description
Source	The source that generated the event. Possible values are described in *Table 5-6*.
Alarm	A description of the event.
Status	Status of the event: Off – event for which no trap is sent. ON – event for which trap is sent.
Severity	Indicated the severity of the relevant alarm MINOR- Minor alarm MAJOR- Major alarm

Clearing the System Log File

➤ To clear the event log:

1. In the System Screen (*Figure 5-16*), choose **5**.

   A confirmation message appears.

2. Enter **Yes** to clear the event log buffer.

5.6 Frequently Asked Questions

Q Is Optimux-106 fiber main link line coding compliant with NRZ?

A Optimux-106 does not comply with NRZ. The fiber optic interface line code is scrambled NRZ. The fiber optic module is RAD proprietary, and cannot work opposite other vendors.

5.7 Technical Support

Technical support for this product can be obtained from the local authorized RAD partner from whom it was purchased.

For further information, please contact the authorized RAD partner nearest you or one of RAD's offices worldwide. This information can be found at www.rad.com (**offices – About RAD > Worldwide Offices; distributors – Where to Buy > End Users**).

Chapter 6

Software Upgrade

Software upgrade is required to fix product limitations, enable new features, or to make the unit compatible with other devices that are already running the new software version.

The Optimux-106 stores up to two versions of the software – each one is a separate partition.

The information includes the following:

- Detailed conditions required for the upgrade
- Any impact the upgrade may have on the system
- Overview of downloading options
- Upgrade via the File Utilities menu
- Upgrade via the Boot menu.

6.1 Impact

Optimux-106 resets automatically after the software upgrade, resulting into up to two minutes of downtime. Upgrade to a new version does not affect any user settings.

6.2 Software Upgrade Options

Application software can be downloaded to Optimux-106 via the TFTP menu (Main Menu›Utilities›File Transfer›TFTP), or via the Boot menu, using XMODEM or TFTP.

6.3 Prerequisites

This section details the Optimux-106 software and versions compatible with the version. It also lists the software file names and outlines system requirements needed for the upgrade procedure.

Software Files

The new version releases are distributed as software files named **OP-106.img**. The files can be obtained from the local RAD business partner from whom the device was purchased.

System Requirements

Before starting the upgrade, verify that you have the following:

- For upgrade via TFTP:
  - Operational Optimux-106 unit with valid IP parameters configured for the host
  - Connection to a PC with a TFTP server application (such as 3Cdaemon or PumpKIN), and a valid IP address
  - Software file (**OP-106.img**) stored on the PC
- For upgrade via XMODEM:
  - Operational Optimux-106 unit
  - Connection to a PC with a terminal emulation application (such as HyperTerminal)
  - Software file (**OP-106.img**) stored on the PC.

6.4 Upgrading Optimux-106 Software via the File Utilities Menu

The recommended software downloading method is downloading by means of the TFTP, using the *Download/upload using TFTP* menu reached from the File Utilities menu.

Network administrators can use this procedure to distribute new software releases to all the managed Optimux-106 units in the network from a central location.

Use the following procedure to download the new software release to Optimux-106 via the File Utilities menu.

1. Verify that the **OP-106.img** is stored on the PC with the TFTP server application.
2. Verify that the Optimux-106 host has valid IP parameters.
3. Ping the PC to verify the connection.
4. Activate the TFTP server application.
5. Download the **OP-106.img** from the PC to Optimux-106.

Note *Configuration values shown in this chapter are examples only.*

Verifying the Optimux-106 Host Parameters

The Optimux-106 host must have host IP parameters configured according to your network requirements. Otherwise you will not be able to establish a proper communication session with the TFTP server. Refer to the following manual section for additional information:

- *Connecting to the ASCII Terminal* in *Chapter 2*
- *Working with Terminal* in *Chapter 3*
- *Configuring IP Host Parameters* and *Configuring the Host Encapsulation* in *Chapter 4*.

➤ To verify the Optimux-106 host parameters:

- Display the Host IP menu (Configuration › System Configuration › Management › Host IP), and verify that the host IP address, IP mask and default gateway are configured according to your network requirements.

```
                              Optimux-106
Host IP

Host IP address                    (172.17.161.73)
Host IP mask                       (255.255.255.0)
Host default gateway               (172.17.161.1)
Read community                     (public)
Write community                    (public)
Trap community                     (public)

>
ESC-prev. menu; !-main menu; &-exit; @-scroll
```

Figure 6-1. Configuring the Host

Activating the TFTP Server

Once the TFTP server is activated on the PC, it waits for any TFTP file transfer request originating from the product, and carries out the received request automatically. *Transferring Software and Configuration Files* section in *Chapter 4* explains how to prepare your PC for the TFTP file transfer.

➤ To run the TFTP server:

- Activate a TFTP server application, such as **3Cdaemon** (available from www.3com.com) or **PumpKIN** (available from http://kin.klever.net/pumpkin/).

Downloading the New Software Release File to Optimux-106

Optimux-106 stores two software versions, each of them in one of the two partitions of its flash memory, which also contains a boot program. The software is stored in compressed format. The active version is decompressed and loaded into the Optimux-106 RAM upon power-up. The passive software is kept for backup purposes. By default, Optimux-106 is delivered with the active software only.

New software releases are distributed as an ***.img** file, which is downloaded to the local Optimux-106 using the TFTP or XMODEM protocol. Upon downloading, the new software release becomes active, the former active software turns into backup, and the former backup is erased.

If a failure occurs during downloading or decompression, the new version is erased from the flash and the backup version becomes active. In this case, only one version is left stored in the flash memory. If the active software becomes corrupted, you can replace it with its backup.

This procedure is used to replace the current software version with the new software release (**OP-106.img**).

Downloading a New Software Release via TFTP

➤ **To download the new software release file via TFTP:**

1. From the SW & File Transfer menu, select **TFTP** (*Figure 6-3*) (Main menu › File Utilities › SW & File Transfer › SW Download › TFTP).

```
                          Optimux-106
Utilities>File Utilities>SW & File Transfer>TFTP

1. Server IP            ...     (172.17.140.200)
2. Remote File Name     ...     ()
3. Command              >       (No Operation)
    Transfer Status     >       (No Operation)
    Transfer Error      >       (No Error)

>
Please select item <1 to 3>
ESC-Previous menu; !-Main Menu; &-Exit                  1 User(s)
```

Figure 6-2. TFTP Menu

Once an IP address is inserted, the "Command" line appears.

Parameter	Possible Values	Description
Server IP	**Default: 0.0.0.0**	IP address of the server to which the file will be uploaded or downloaded.
Remote File Name	String of up to 40 characters	Name of the file to download from server or upload to server.
Command	No Operation Software Download Software Upload Configuration File Download Configuration File Upload	 Downloads software from the server Uploads current software version to the server

Transfer Status		Current status of the TFTP download.
	No operation	No TFTP transfer is in process
	Connecting	Initiating a TFTP connection.
	Transferring data	TFTP data transfer is in process.
	Ended Time out	The transfer terminated because the Retry Timeout or Total Timeout was exceeded.
	Ended OK	The file was successfully transferred.
	Error	The transfer terminated because an error occurred. Check the Transfer Error parameter for details about the error.
Transfer Error	No error Error resources Error timout Error use msg Error nofile Error acceess Error disk full Error illegal op Error bad tid Error exists Error no user	Error code when Transfer Status is **Error**. This parameter provides specific details of the error that occurred while attempting to download the file. This parameter is set to No error unless an error is detected.

2. From the TFTP menu, perform the following steps:
   1. Choose **Server IP** and enter the IP address of the server from which you want to download the new software file.
   2. Choose **Remote File Name** and enter the name of the file you want to download.
   3. Choose **Command** and then choose **Software download**.

      The download process begins. The Transfer Status field indicates the current status of the download.

Downloading a New Software Release via XMODEM

Notes

- *Installation of the new software releases via XMODEM is not possible over Telnet.*
- *To minimize the software downloading time, it is recommended to configure the CONTROL port to the highest available data rate.*

➤ **To download a new software release via XMODEM:**

1. From the SW & File Transfer menu, select **XMODEM** (Utilities › File Utilities › SW & File Transfer › XMODEM).

   Optimux-106 responds with the following string:

```
PLEASE OPEN XMODEM APPLICATION.

For exit press Q(uit)
```

If you press **<Q>**, Optimux-106 aborts the download process and displays **`Download failure. Press Esc to continue.`** message in addition to the previous display.

2. Send the ***.img** file to Optimux-106 using the XMODEM protocol of your terminal application.

   Once downloading is complete, Optimux-106 decompresses the release file, displaying the following message:

```
Final process download. Reset device after 5 seconds
```

   After the decompression, Optimux-106 is automatically reset. This causes the new software to be loaded into the modem's RAM.

Note *You need to run an XMODEM application on the remote computer to invoke the download.*

6.5 Upgrading Optimux-106 Software via the Boot Menu

Software downloading may also be performed using the Boot menu. The Boot menu can be reached while Optimux-106 performs initialization, for example, after power-up.

You may need to start the loading from the Boot menu when it is not possible to activate TFTP from the Download/upload using TFTP menu (for example, because the Optimux-106 software has not yet been downloaded or is corrupted).

Caution The Boot menu procedures are recommended only for use by authorized personnel, because this menu provides many additional options that are intended for use only by technical support personnel.

Two software downloading options are available from the Boot menu:

- Downloading using the XMODEM protocol. This is usually performed by downloading from a PC directly connected to the CONTROL port of the unit.
- Downloading using the TFTP. This is usually performed by downloading from a remote location that provides an IP communication path to an Ethernet port of Optimux-106.

Using the XMODEM Protocol

Use the following procedure to download the new software release to Optimux-106 via XMODEM.

1. Verify that the *.img file is stored on the PC with the terminal application.

2. Configure the communication parameters of the selected PC serial port for asynchronous communication for 115.2 kbps, no parity, one start bit, eight data bits and one stop bit. Turn all types of flow control off.
3. Turn off Optimux-106.
4. Activate the terminal application.
5. Turn on Optimux-106 and immediately start pressing the **<Enter>** key several times in sequence until you see the Boot screen. A typical screen is shown below (the exact version and date displayed by your Optimux-106 may be different).

Note *If you miss the timing, Optimux-106 performs a regular reboot process (this process starts with **Loading** and ends with a message to press **<Enter>** a few times to display the log in screen).*

```
RAD Optimux-106 Boot Version 1.00 (Nov 9 2004)
RAD Boot Manager Version 7.01 (Nov 9 2004)

0 - Exit Boot-Manager
1 - Dir
2 - Set Active Software Copy
3 - Delete Software Copy
4 - Download Files or an Application by XMODEM
5 - Format flash
6 - Show basic hardware information
7 - Reset board
8 - System Configuration.
9 - Download an Application by TFTP
Press the ESC key to go back to the Main Menu.
Select:
```

Figure 6-3. Boot Manager Menu

➤ **To download software release via XMODEM:**

1. From the Boot menu, select Download an Application by XMODEM. You will see a message that requests the partition number to which the new software is to be downloaded, and offers a recommended value.
2. If there is no special reason to select a different value, type the recommended number and then press <Enter>. A typical display is shown below:

```
Select Copy number for download ( 1 )
Select: 1
```

3. The process starts, and you will see:

```
Erasing Partition please wait ....
Please start the XMODEM download.
```

4. Start the transfer in accordance with the program you are using. For example, if you are using the Windows HyperTerminal utility:
   - Select **Transfer** in the HyperTerminal menu bar, and then select **Send File** on the **Transfer** menu.

The **Send File** window is displayed:

- Select the prescribed Optimux-106 software file name (you may use the **Browse** function to find it).
- In the **Protocol** field, select **XMODEM.**

- When ready, press **Send** in the **Send File** window. You can now monitor the progress of the downloading in the **Send File** window.

Note *If downloading fails, repeat the whole procedure.*

5. When the downloading process is successfully completed, you will see a sequence of messages similar to the following:

```
Loading ...
Decompressing to RAM.

Processing archive: FLASH
Extracting OP106.BIN
.....................................................
..................................................................... CRC OK
Running ...
**********************************************************************
* In order to start working - press the ENTER button for few times*
**********************************************************************
```

6. At this stage, press the **<Enter>** key several times to go to the log in screen.

Using the TFTP

Use the following procedure to download software release to Optimux-106 via TFTP.

1. Verify that the *.img file is stored on the PC with the TFTP server application.
2. Define IP parameters via the Boot Manager menu.
3. Activate the TFTP server application.
4. Download the *.img file from the PC to Optimux-106.

➤ **To define IP parameters via the Boot Manager menu:**

1. From the Boot Manager menu (*Figure 2-3*), select **System Configuration** to start the configuration of the Optimux-106 IP communication parameters, as needed for TFTP transfer.

   The parameters are displayed in consecutive lines. For each parameter, you can accept the current values by simply pressing **<Enter>** to continue, or type a new value:

   - **IP Address**: used to select the IP address of Optimux-106. To change the current value, type the desired IP address in the dotted quad format, and then **<Enter>** to continue.

- **IP Mask**: used to select the IP subnet mask of Optimux-106. To change the current value, type the IP subnet mask address in the dotted quad format, and then **<Enter>** to continue.
- **Default Gateway Address**: when the TFTP server is located on a different LAN, you must define the IP address of the default gateway to be used by Optimux-106. Make sure to select an IP address within the subnet of the assigned Optimux-106 IP address. To change the current value, type the desired IP address in the dotted quad format, and then **<Enter>** to end the configuration.

  If no default gateway is needed, for example, because the TFTP server is attached to the same LAN as Optimux-106 being loaded, enter **0.0.0.0**.

2. Press **<Enter>** to display the Boot menu.
3. Select **Perform Reset to the board** to reset Optimux-106. The new parameters take effect only after the resetting is completed.

➤ **To download software from the Boot menu using TFTP:**

1. From the Boot menu, select **Download an Application by TFTP** and then press **<Enter>** to start the TFTP transfer.

   Please Enter the Target File Name message is displayed.
2. Enter the name of the desired software distribution file (make sure to include the path, when necessary). When done, press **<Enter>** to continue.

   Please Enter the Server IP address message is displayed.
3. Enter the IP address of the server on which the software distribution file resides and then **<Enter>** to continue.

   If no errors are detected, the downloading process starts, and the screen displays its relative progress.
4. After the transfer is successfully completed, return to the Boot menu and select **Exit Boot-Manager**.

   When the Optimux-106 initialization is ended, the unit loads the new software.

Note *If downloading failed, repeat the whole procedure.*

Chapter 7

Configuring a Typical Application

This chapter gives detailed instructions for configuring Optimux-106 for a typical application.

A terminal can be used to configure a local Optimux-106. However, to configure remote units, Telnet or SNMP is required. *Figure 7-1* illustrates a point-to-point connection extended by a pair of Optimux-106 units.

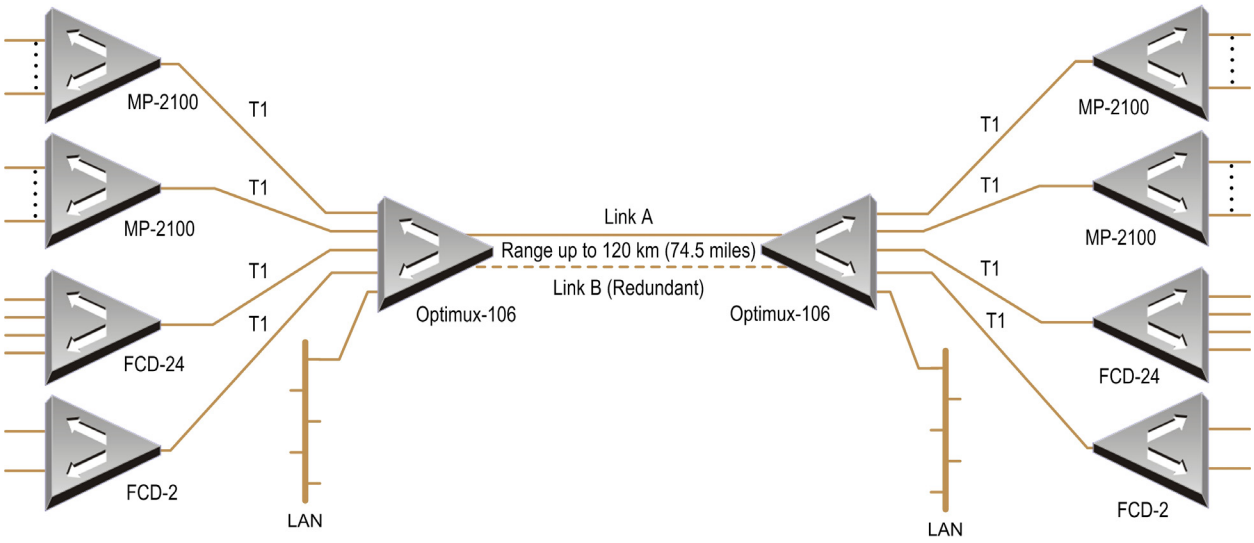


Figure 7-1. Optimux-106 with Ethernet User Port Point-to-Point Application

7.1 Configuring the Optimux-106 Units

➤ **To prepare a control session:**

1. Connect all Optimux-106 connectors to the appropriate media.
2. Turn on the control terminal.
3. Configure the terminal to the default communication parameters: 115,200 baud, 8 bits/character, 1 stop bit, no parity, flow control: none.
4. Set the terminal emulator to VT100 emulation.

   You are now ready to start a control session.

➤ To enter user name and password:

1. Type in you user name.

Note

*Enter **su** or **SU** for full configuration and monitoring access.*

2. Type in your password at the › prompt (up to eight characters).

   Optimux-106 responds to your entry with asterisks.

Note

*The default password is **1234**.*

3. Press ‹Enter›.

   The Main menu is displayed.

7.2 Configuring the System Parameters

➤ To configure the Optimux-106 system parameters:

1. Configure the Ethernet port (Main Menu›Configuration›Physical Layer› **Ethernet**).
2. Configure the channel type for each of the T1 ports (Main Menu› Configuration›Physical Layer›**T1**).
3. Configure the Uplinks (Main Menu›Configuration›Physical Layer›**Link**).
4. Configure the Masking of the System Alarms (Configuration›System›**Alarms**).

Appendix A
Pinouts

A.1 Tributary Connectors

The tributary interface is RJ-45 eight-pin connector. Connector wiring is listed in *Table A-1*.

A.2 T1 Connectors

The pin assignment of the T1 RJ-45 connector is given in *Table A-1*.

Table A-1 T1 RJ-45 Connector Pin Assignment

Pin	Designation	Direction	Function
1	RD(R)	Input	Receive Data (Ring)
2	RD(T)	Input	Receive Data (Tip)
4	TD(R)	Output	Transmit Data (Ring)
5	TD(T)	Output	Transmit Data Tip
3, 6, 7, 8	–	–	Not connected

A.3 Alarm Connector

The Optimux-106 ALARM connector is a 9-pin female connector, which includes the contacts of the major and minor alarm relays. *Figure A-1* shows the pin functions. The relay positions are shown in the non-energized (alarm active) state.

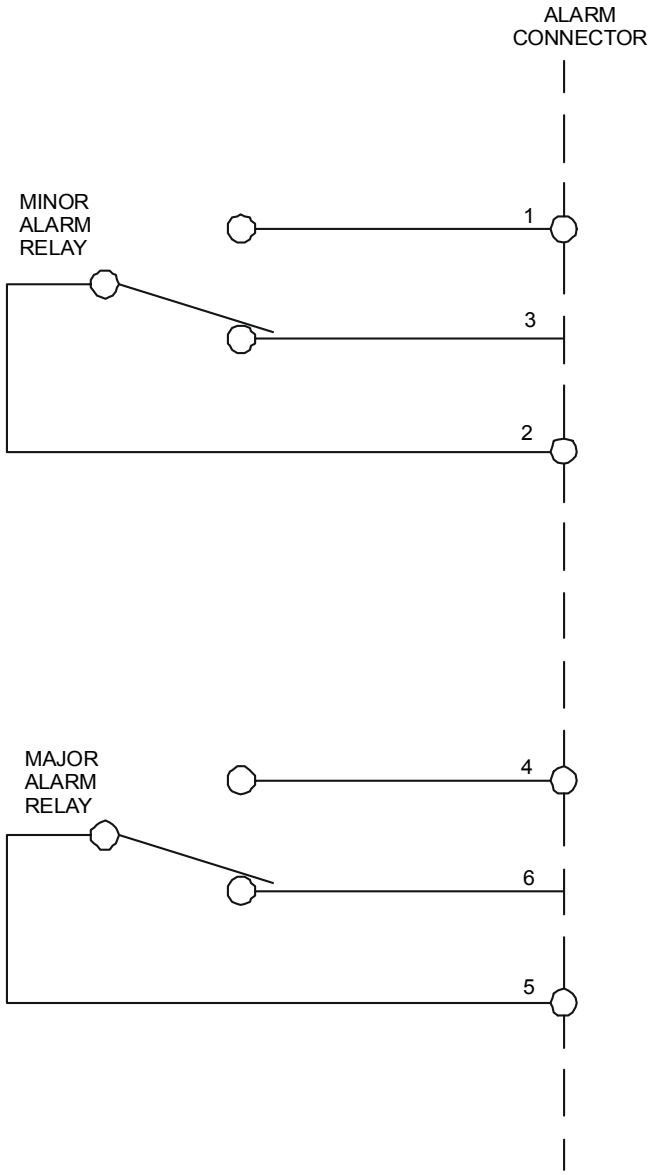


Figure A-1. ALARM Connector Wiring

Alarm Cable

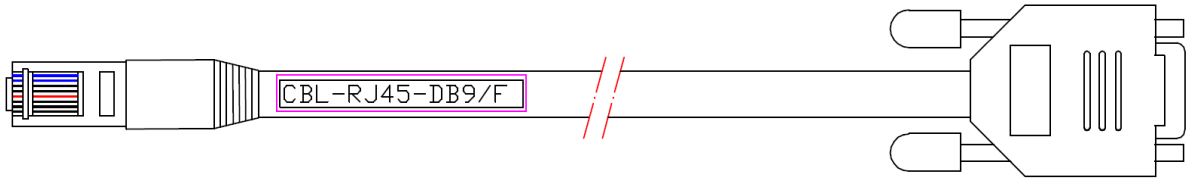


Figure A-2. Alarm Cable - CBL-RJ45-DB9/F

Table A-2 Alarm Cable Pin Assignment

RJ-45	DB-9
1	1
2	6
3	2
4	4
5	9
6	5

A.4 Control Connector

The optional Optimux-106 supervisory port has a standard RS-232 DTE interface. The physical interface is a Mini-USB connector, designated CONTROL. The following table lists the pinout for this connector.

Table A-3. CONTROL Mini-USB Connector Pin Assignment

Pin	Designation	Function	Direction
1	–	CAP to GND	–
3	RX	Receive	Input
2	TX	Transmit	Output
5	GND	Ground	–
4	RS-232 Enable	–	Input

Control Cable - CBL-MUSB-DB9F

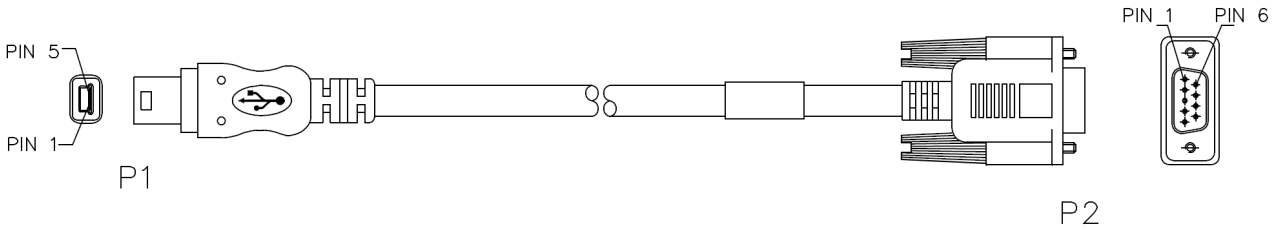


Figure A-3. Control Cable - CBL-RJ45-DB9/F

Table A-4. Control Cable Pin Assignment

2		2
3		3
4		5
5		
SHELL	DRAIN+BRAID	SHELL
P1	COLOR	P2
CONNECTION TABLE		

A.5 MNG-ETH and USER-ETH Connector

One LAN Ethernet RJ-45 connector is mounted on the MNG-ETH module. The following table lists the pinout for this connector.

Table A-5. MNG-ETH and USER-ETH RJ-45 Connector Pin Assignment

Pin	Designation	Function	Direction
3	RX+	Receive – positive lead	Input
6	RX-	Receive – negative lead	Input
1	TX+	Transmit – positive lead	Output
2	TX-	Transmit – negative lead	Output
4, 5, 7, 8	–	CAP to GND	–

Appendix B

Optimux-106 MIBs

A MIB (Management Information Base) is a database of managed objects. The MIB contains the data regarding the network elements being controlled and monitored. Each characteristic of the element to manage is defined as an object in the MIB. The MIB is a hierarchical tree structure that acts as the repository for defined objects. Each object has an object name, a type, syntax, an access code (read-write, read-only, not-accessible, and write-only) and a status (mandatory, optional, obsolete).

Optimux-106 supports appropriate groups (tables) of MIB II (SNMP standard MIB), the RAD Private MIB as follows:

MIB	Notes	Tables
RFC3418	MIB-II	IANAiftype
RFC2863	MIB-II	if
RFC3593	MIB-II	PreHist-TC
RFC3895	Partially supported	dsx1ConfigTable
RAD Private MIB	Partially supported	–
	– radGen	physicalConnectorTable
	– optimux	mngTrapIPTable agnTrapMask (object) agnLed (object) OptMxConfigTable

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Publication Number: 325-200-03/09

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Manual organization	❒	❒	❒	❒	❒
Illustrations	❒	❒	❒	❒	❒
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